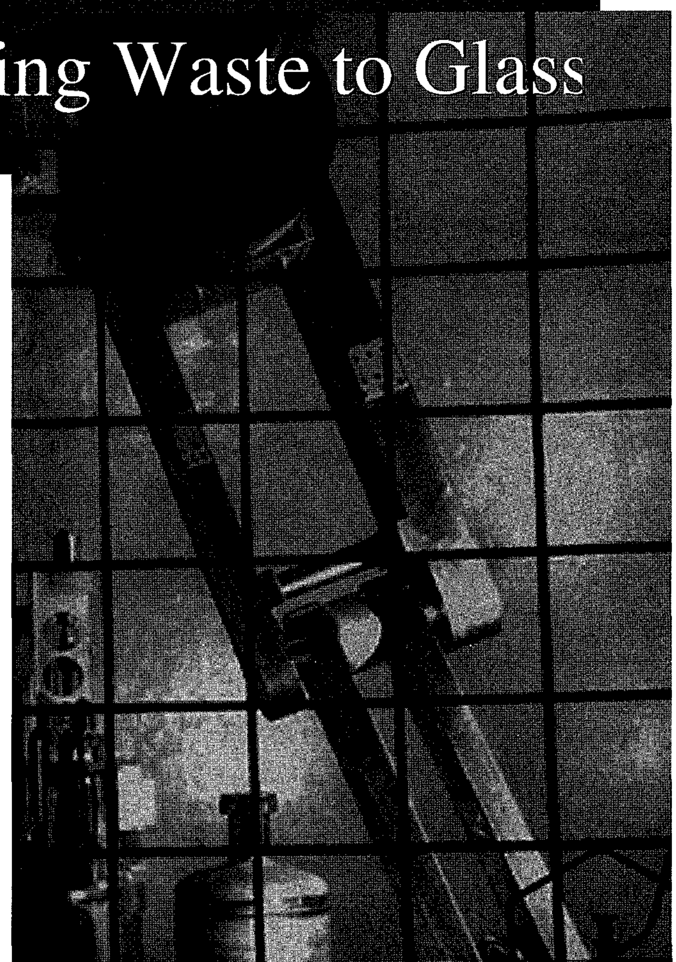
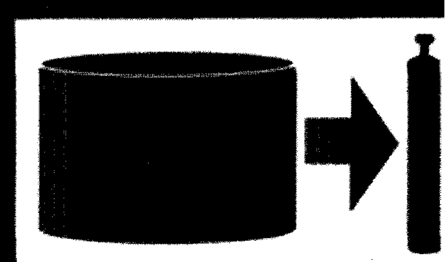
HLW-99-0008

Savannah River Site High Level Waste System Plan

Converting Waste to Glass



An Integrated System at the Savannah River Site



Revision 10

June 1999

with October 1999 Update

HLW-99-0008

High Level Waste Division

High Level Waste System Plan Revision 10 (U)

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Per a May 1999 DOE-HQ decision, a new strategy for alternative salt processing will be developed. The impacts of this directive have not been incorporated into the development of this Revision of the Plan

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Executive Summary

The Savannah River Site (SRS) in South Carolina is a 300-square-mile Department of Energy (DOE) complex that has produced nuclear materials for national defense, research, and medical programs since it became operational in 1951. As a waste by-product of this production, there are approximately 34 million gallons of liquid, high-level radioactive waste currently stored on an interim basis in 49 underground waste storage tanks. Continued, long-term storage of these liquid, high-level wastes in underground tanks poses an environmental risk (nine of the SRS tanks have a waste leakage history). Therefore, the High Level Waste (HLW) Division at SRS has, since FY96, been removing waste from tanks; pre-treating it; vitrifying it; and pouring the vitrified waste into canisters for long-term disposal. From FY96 to the end of FY99, over 700 canisters of waste will have been vitrified. The canisters vitrified to date have all been sludge waste. Salt waste processing was suspended in FY98 for technical reasons. The Record of Decision for selecting an alternative salt processing technology is scheduled for spring 2000, with construction of a salt processing facility scheduled to be completed by FY08 or FY10, depending on available funding.

Funding Issues

Funding over the next five years will play a key role in determining the success of the High Level Waste Program at SRS. There are three funding cases: Target, Planning and Requirements. The System Plan Planning Case is the basis for the "Planning Case" in the FY01 "Paths to Closure" plan.

Target Case: DWPF Stops Producing Canisters

The Target Case funding for FY01- FY06 is not sufficient to continue sludge canister production or to keep the salt processing startup on schedule. At the Target funding level, the HLW System —

- Does not vitrify waste or fill canisters for nine years
- Delays the salt processing startup schedule by two years (until FY10)
- Violates regulatory commitments

Planning Case: HLW System Continues Canister Production
(Incremental Funding: $100 million direct only dollars)

The Planning Case assumes funding for FY01 that will be sufficient to continue uninterrupted sludge canister production, but not sufficient to maintain the salt processing startup schedule. At this Planning funding —

- DWPF will vitrify 200 canisters of sludge-only waste.
- The rest of the HLW System (primarily waste removal line item and operations and waste pre-treatment) will operate to make feed ready for continued DWPF operations.
- The HLW System can not maintain the salt processing startup schedule

Requirements Case: Maintains Salt Processing Schedule
(Incremental Funding: $35 million direct only dollars)

The Requirements Case assumes the incremental $100 million of funding for FY01 to continue uninterrupted sludge canister production and also assumes an additional $35 million to maintain the salt processing plant schedule. At the Requirements funding, the HLW System —

- Maintains the salt processing schedule for a FY08 plant startup.

Comparison of Cases	Target	Planning	Requirements
DWPF Sludge Production (in canisters per year)			
• FY01 to FY09	0	200	200
• FY10 to End of Program	200	200	200
Date Salt Processing Becomes Operational	FY10	FY10	FY08
Are all regulatory commitments met?	No	Yes	Yes
Date by which 22 'high risk" tanks are emptied	FY19	FY17	FY16
Date by which waste processing is completed	FY33	FY26	FY24
Increased FY01 funding Above Budget Target (millions in direct only dollars)	0	$100*	$135
Estimated Life-Cycle Costs			
• Costs in escalated dollars (billions)	$26.8	$20.8	$19.5
• Costs in constant 1999 dollars (billions)	$16.6	$14.1	$13.6

* NOTE: The $100 Million is direct only dollars and would be the required incremental funding for the Site. Sufficient funding from the Site must then be re-allocated to cover the $33 Million in Site Overheads.

Incremental Funding Needed in FY01

- To continue DWPF sludge production ($ 100 million needed in FY01)
- To avoid a slowdown of the Alternative Salt Project ($ 35 million needed in FY01)

Continue DWPF Sludge Production at 200 Canisters per year

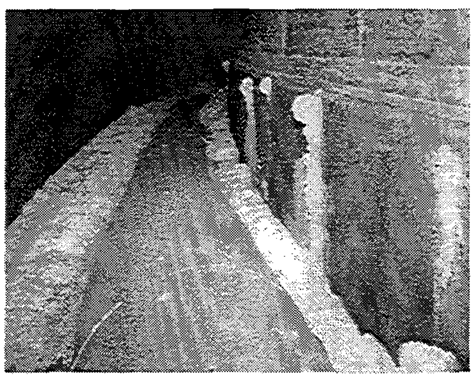
($ 100 Million in Incremental Funding Needed in FY01)

At the current FY01 and out-year budget targets, the Defense Waste Processing Facility (DWPF) will stop vitrifying waste and will suspend canister production from FY01-FY09. In addition, the other facilities in the waste removal system (that are readying tanks for waste removal and preparing waste to feed to DWPF) will suspend activities. Additional funding should be provided so that the waste removal system can send waste to DWPF and DWPF can continue to produce sludge-only canisters at a rate of 200 canisters per year. Continuing to process sludge waste is important to —

- Minimize risks of storing highly radioactive waste in "high-risk" Type I, II and IV tanks;
- Meet regulatory commitments;
- Maintain the DWPF investment in trained personnel and operating facilities;
- Maintain the waste removal completion date;
- Reduce the overall life-cycle costs of the waste removal program.

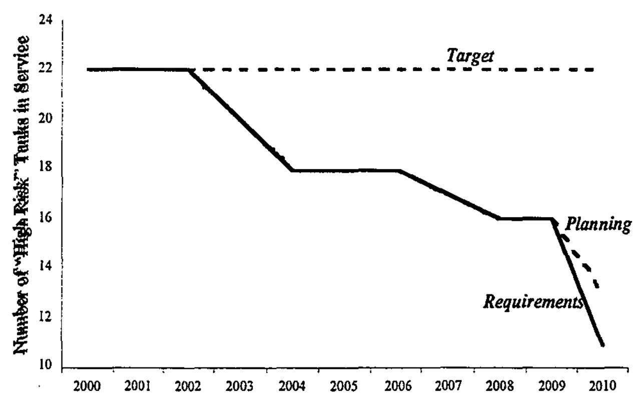
Minimize Environmental Risks of Continued Storage of Waste in "High Risk" Tanks

The age and condition of the waste storage tanks at SRS is of increasing concern. The 22 Type I, II and IV waste tanks are described as being "high risk" because they do not meet current secondary containment and leak detection standards. These tanks, which were placed in service between 1954 and 1965 and sit near or at the water table, currently contain 6.9 million gallons of waste and 135 million curies of radioactivity. Over the years, nine of these tanks have leaked waste from the primary tank into the secondary pan. In one case, some waste leaked from the secondary pan into the environment. In the last two years, two additional tank integrity issues have arisen: a lateral crack and increased corrosion.



Tank Annulus showing High Level Waste that has leaked from the Primary Tank in the past and has solidified

"High Risk" Tanks Being Used



- One "high risk" tank has developed a type of leak site not previously seen: a crack running parallel to the weld seam, above the waste level, approximately 18 inches in length. If other tanks develop similar leak sites, the risk of releases and the complexity and cost of future waste removal will be increased.
- Increased corrosion is being seen in several tank secondary containment pans. These secondary pans, which represent the last lines of defense for waste, already contain waste from previous leaks in the main walls of the tanks. Although SRS maintains an aggressive program to monitor the integrity of all waste tanks and all waste is being appropriatly managed, these recent findings underscore the urgency to complete waste removal as soon as possible.

In the Planning and Requirements funding cases, waste is removed from 9-11 of these "high risk" tanks by the end of FY10. In the Target case, all "high risk" tanks continue to be used during this 10-year period.

Meet Regulatory Commitments

There are two primary regulatory commitments driving waste removal: the Federal Facilities Agreement (FFA) and the Site Treatment Plan (STP). The FFA requires that the SRS "high risk" tanks be emptied and closed on an approved tank-by-tank schedule. The STP requires that an average of 200 canisters per year be vitrified and that processing of all high-level waste be completed by FY28. In the Target funding case, neither of these regulatory commitments are met.

Maintain the Investment in the DWPF Facility

The continued operation of DWPF ensures that all operating personnel, equipment, and systems will be maintained in good condition. However, in the Target case the facility would be placed in cold standby, requiring substantially re-investments to update the facility and rehire and retrain key personnel prior to resuming processing in FY10.

Complete Waste Removal from All Tanks

All High Level Waste at SRS site can be removed from tanks and vitrified by FY26 if funding constraints do not delay the program. However, in the Target case, all waste will not be vitrified until FY33, a full 7-year delay.

Reduce Life Cycle Costs by $ 6 Billion

The life cycle cost for the HLW System in the Planning Case is $20.8 billion, a reduction of $6.0 billion from the estimated $26.8 billion life cycle cost of the Target Case. The additional costs for the Target Case are due to delaying production in the short run and extending the completion date of the waste removal program.

Keep the Salt Processing Project on schedule for a FY08 Startup

($ 35 Million in Incremental Funding Needed in FY01)

The current Target and Planning Budgets only fund the Alternative Salt Processing Project on a schedule for a FY10 startup date. Incremental funding to the Requirements Case would keep the start up of this critical plant in FY08. This strategy would —

- Avoid re-use of "High-Risk" Tanks;
- Improve the completion date of the waste removal program;
- Reduce the life-cycle costs of the waste removal program.

All parts of the waste removal process at SRS are operational except the salt processing plant. Work on salt processing was suspended in January 1998, due to technical issues with the In-Tank Precipitation (ITP) Facility. Since January 1998, a rigorous systems evaluation has been completed on all available salt processing technologies. WSRC is currently overseeing the completion of Research and Development for process selection on the most promising alternatives. By the end of 1999, DOE is scheduled to have selected the preferred technology for salt processing. A final Record of Decision on the selected technology is scheduled for spring 2000. It will then become critical to fund and construct the salt processing project in a timely and expeditious manner.

Re-using "High-Risk" Tanks

A major concern in delaying salt processing is the necessity to re-use "high risk" tanks. If salt processing is operational by FY08, there will be adequate waste storage space available in newer style tanks. However, if salt processing is delayed until FY10, the newer style tank space will have been utilized and waste will have to be re-introduced into up to three "high-risk" tanks, which will stay in service for up to five additional years. While this option does not violate current regulatory commitments, it does increase environmental risks of waste storage.

Completion of Waste Removal

With incremental funding to the Requirements Case, the waste removal program at SRS for both sludge and salt waste can be completed as early as FY24. This is nine years earlier than in the Target Funding case and two years earlier than in the Planning Case.

Life Cycle Cost Reductions of $7.4 Billion

The life cycle cost for the HLW System in the Requirements Case is $19.5 billion, a reduction of $7.4 billion from the estimated life cycle cost of the Target Case and a reduction of $1.4 billion from the estimated life cycle cost of the Planning case. These cost reductions accrue from continuing sludge processing without a stoppage and from completing the waste removal program earlier.

High Level Waste Program a Proven Success

The High Level Waste System at SRS has been successful over the last several years as it transitioned from a safe storage operation to a waste removal and canister production operation. During the same time period substantial cost reductions have been identified and incorporated into the program.

DWPF Production Successes

The number of canisters filled at DWPF has increased each year since startup in FY96:

- FY96 64 canisters filled (goal was 60)
- FY97 169 canisters filled (goal was 150)
- FY98 250 canisters filled (goal was 200)
- FY99* 250 canisters filled (estimate)

*Note: FY99 was also a year in which substantial Y2K upgrades were accomplished.

To accomplish these production rates, a number of improvements have been implemented at DWPF–

- Reduced sample turnaround times
- Improved operating and sampling sequences to minimize flow sheet bottlenecks
- Increased fill height in canisters
- Development and use of replaceable melter pour spout inserts
- Installation of Temporary Modifications to allow Y2K modifications with minimal impact to canister production

First HLW Tank Closures in the DOE Complex

SRS met the challenge of emptying and closing the first two high-level waste tanks in the DOE complex. This required the site to:

- Work effectively with regulators, the public and industry to reach agreement on the closure method
- Develop closure plans and criteria based on waste characterization, analysis and modeling
- Build, test and deploy new technology and tools to remove waste from the tanks
- Remove residual waste material from the tanks
- Isolate and fill the tanks with a cement-like grout to complete closure

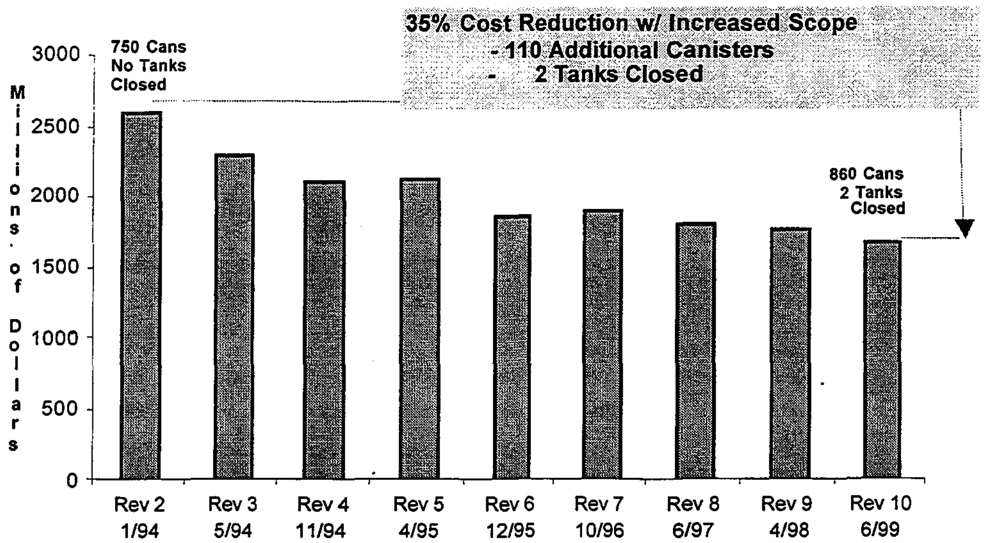
Maximizing Accomplishments while Focusing on Cost Reductions

The estimated costs for the High Level Waste Program at SRS have been reduced significantly over the last several years. Each revision of the System Plan since Revision 2 in 1994 has included cost estimates for the waste removal program. To illustrate how these cost estimates have been reduced, the graph below compares the estimated costs for the four-year period FY97-FY00. The graph shows that —

- Planned Funding has decreased 35%;
- Planned Canister Production has increased from 750 to 860;
- Planned Tank Closures have increased from 0 to 2.

To realize these estimated cost reductions, SRS has had in place since 1994 an aggressive Productivity Improvement Program and scope prioritization process. The savings in the HLW program alone amount to a 35% cost reduction for the four-year period. This has enabled SRS to reduce cost estimates and absorb mandatory funding reductions while increasing its commitment to safety, canister production, and tank closure. However, after several years of sharply reduced funding levels, additional funding reductions cannot be absorbed without corresponding scope deferrals. Planned Infrastructure improvements must be funded to ensure facility conditions are maintained to continue safe storage of waste.

Reductions in Cost of Implementing High Level Waste Program - FY97 to FY00



Incremental Funding Is Required for Success

The following chart shows the incremental annual funding from the Target Case to the Requirements Case and then from the Target Case to the Planning Case, by year from FY01-FY07. At the bottom, the chart then shows the total life cycle savings that can be achieved with this incremental funding. In summary, an investment of $1.0 to 1.3 billion from FY01 through FY07 will result in a $6 to 7.4 billion life cycle costs savings over the life of the waste removal program. This is a 22 to 27% saving in life cycle cost relative to the Target Case.

Year	Investment Required in Millions of Dollars (Incremental over Target Case)	
	Requirements Case	Planning Case
FY01	168	133
FY02	191	141
FY03	244	193
FY04	246	191
FY05	230	173
FY06	236	171
FY07	(9)	32
Total	1,304	1,034
Life Cycle Savings	7,351	5,981
% Savings	27%	22%

Incremental Funding will Lead to Results

If incremental funding is provided in FY01 to the Planning Case ($100 million direct only dollars) —

- DWPF sludge canister production will continue without interruption.
- The HLW System will continue to make waste feed ready for DWPF.

If incremental funding is provided in FY01 to the Requirements Case ($135 million direct only dollars) —

- DWPF sludge canister production will continue without interruption.
- The HLW System will continue to make waste feed ready for DWPF.
- The Alternative Salt Project will stay on schedule for an FY08 Startup.

Key Process Issues

Work is currently underway to address several key process issues that have significant impacts on HLW's ability to implement the HLW System Plan.

Tank Farm Waste Storage Space

The Tank Farms' useable waste storage space is continuing to be consumed by delays in the start of salt processing, planned long term sludge-only DWPF processing, and continued receipts of Canyon wastes. If the waste generating facilities perform as planned, then the Tank Farm waste inventory will exceed the storage capacity in Type III tanks (currently designated for waste storage) by FY03. Insufficient waste storage space will impact the Tank Farms' ability to support operations in DWPF and the Canyons or lead to adding concentrated waste to alternative storage locations. To support the HLW Program, Revision 10 of the HLW System Plan assumes that 3 old-style, high risk tanks will be re-used to store waste.

With the delay in Salt Processing from FY02 to FY10 a HLW Space Management (SM) Team has been chartered to recommend the best management practices for safe stewardship of high level waste while maximizing available tank space. The SM team is expected to issue a final report in the fourth quarter of FY99. The results of this report will be incorporated into the next revision of the Plan.

HLW Processing Parameters Uncertainty

Changes in a few key waste characteristics dramatically impact HLW process planning and the overall length of the HLW Program. For example, the estimated total number of canisters produced at DWPF was increased from approximately 5,200 in Revision 9 of the HLW System Plan to about 5,700 in this revision. The increase in total projected canisters results from actual production experience associated with the sludge loading in canisters and a new estimate of sludge solids existing in the waste tanks. Operating experience in facilities throughout the HLW System will improve our understanding of the relationships among waste composition, waste characteristics, and waste processing. The length of the HLW Program will continue to be influenced by new inventory information resulting from operating experience and continuing sample analyses.

Salt Processing Disposition

Salt waste processing was suspended in FY98 for technical reasons. The Record of Decision for selecting an alternative salt processing technology is scheduled for spring 2000, with construction of a salt processing facility scheduled to be completed by FY08 or FY10, depending on available funding. Conclusions and recommendations made in Revision 10 of the HLW System Plan can be significantly impacted depending on the final alternative selected and its associated startup date. Per a May 1999 DOE-HQ decision, a new strategy for alternative salt processing will be developed. The impacts of this directive have not been incorporated into the development of this Revision of the Plan.

Age of the HLW Facilities

The material condition of many HLW facilities constructed from the early 1950's to the late 1970's has deteriorated. Routine repairs to service systems in the Tank Farms have escalated into weeks of unplanned downtime due to poor condition of the service piping and obsolete instrumentation. The Tank Farm cannot be shutdown as it contains approximately 34 million gallons of highly radioactive waste, much of it is in a mobile form. Planned Infrastructure improvements must be funded to ensure facility conditions are maintained to continue safe storage of waste.

Introduction

Revision 10 of the High Level Waste System Plan documents the current operating strategy of the HLW System at SRS to receive, store, treat and dispose of high-level waste. This HLW System is a fully integrated operation. It involves safely storing high-level waste in underground storage tanks, removing, pre-treating, and vitrifying this high-level waste; and storing the vitrified waste until it can be permanently disposed of in a Federal Repository. The reference date of Revision 10 is January 22, 1999. Schedules, forecasted budget, milestones, cost estimates and operational plans were current as of that date.

By the end of this fiscal year, over 700 vitrified waste canisters will have been produced. Two waste tanks were closed by the end of FY98. This will leave the Tank Farms with an estimated 34 million gallons of waste containing approximately 480 million curies of radioactivity to be disposed of over the next 20 to 30 years.

Revision 10 of the HLW System Plan analyzes and compares the programmatic and funding requirements to support three cases, a Planning Case, and two Alternative Cases:

- **Planning Case** – DWPF production of 200 canisters per year beginning in FY00, Salt Processing startup in FY10.

Alternative Cases:

- **Requirements Case** – DWPF production of 200 canisters per year, Salt Waste Processing startup in FY08
- **Target Case** – No DWPF production from FY01 to FY09, Salt Processing beginning in FY10.

The System Plan Planning Case is the basis of the "Planning Case" in the FY01 "Paths to Closure" plan. The Requirements Case depicts the cost and productivity advantages of beginning Salt Waste Processing in FY08. The Target Case aligns with the DOE-SR current target funding level guidance for FY00 to FY06 and depicts the impacts of such funding. An evaluation of the three cases provides a clear understanding of the benefits to be achieved if the required incremental funding levels can be obtained to make the Requirements Case possible and the detrimental effects of the Target Case.

State of the HLW System

The status of each key HLW facility is summarized below.

H-Tank Farm: The 2H Evaporator system has not experienced significant unplanned outages during FY98 or FY99. The performance of the 2H Evaporator has greatly exceeded expectations: at the time of this Plan, the 2H Evaporator had gained ~886,000 gallons of space vs. a pro-rated goal of 794,000 gallons for FY99. H-Tank Farm has ~1,500,000 gallons of "Usable Space" (see Appendix B – Glossary, and Section 8.1.1 for a full definition of "Useable Space") available. In order to maintain usable space in the Tank Farms until the Salt Processing Facility startup, the evaporators must evaporate dilute supernate (backlog) from Type III tanks. This is expected to recover approximately 2,500,000 gal of actual space over the period FY99-FY01. Startup testing of the 3H Evaporator (sometimes referred to as the Replacement High Level Waste Evaporator – RHLWE) has identified several minor operating issues. Resolution of these issues will delay the startup to the end of 1999.

F-Tank Farm: At the time of this Plan, the 2F Evaporator had gained 136,000 gallons of space vs. a pro-rated goal of 240,000 gallons for FY99. During the year, the 2F system experienced several planned and unplanned outages that varied from utility infrastructure problems to TSR implementation of key components. In addition, during FY98, two Inter Area Line (IAL) transfers (~530,000 gallons) were made to the 2F system to begin to evaporate backlog waste from HTF. F-Tank Farm has ~300,000 gallons of "Usable Space" available

Tank Closure: Tanks 17 and 20 operational closure is complete; these are the first two high level waste tanks to be closed in the U.S. The Tank 16 annulus was sampled in FY98 and it was determined that further annulus cleaning will be required before final closure. The first tank cluster will be closed in FY04 (Tanks 17-20). Based on work to date, it is evident that, prior to tank closure, most tanks will require some type of chemical cleaning to meet residual waste limits.

Waste Removal: Construction of waste removal equipment continues on Tanks 8 and 11 as well as on supporting services in both Tank Farms. Design continues on Tanks 7 and 11. Routing all signals and controls for Tanks 29-32, 35-37 and associated West Hill facilities to the 3H Evaporator (RHLWE) Control Room continues. There have been significant Lessons Learned obtained from Tank 8 preparation work that will be factored into future waste removal tanks where possible. Low funding levels in FY00 moved much of the construction scope for Tanks 7 and 11 into FY01. This leaves minimal schedule contingency for recovery from unexpected delays as were experienced on Tank 8 (tank riser interferences, high radiation rates, waste characterization issues, etc.). The FY00 President's Budget will provide a significant challenge to maintaining an uninterrupted feed supply for DWPF if an average of 200 cans per year is maintained.

Extended Sludge Processing (ESP): Sludge Batch 1A feed to DWPF was completed in September 1998. Tank 51 is currently feeding Sludge Batch 1B to DWPF. Preparations are in progress to enable Tank 40 to start washing Sludge Batch #2. The available waste in Tank 50 (approximately 300,000 gallons) was fed to Saltstone and processed in FY98. Tank 50 has sufficient volume to store 4-5 years worth of waste concentrate before Saltstone will be required to resume operation.

Salt Waste Processing: Work on salt processing was suspended in January 1998, due to technical issues with the In-Tank Precipitation (ITP) Facility. Since January 1998, a rigorous systems engineering evaluation was completed on all available salt processing technologies, reducing the options from 130 to three alternatives: Small Tank Tetraphenylborate Precipitation, Crystalline Silicotitanate (CST) Non-Elutable Ion Exchange, and Direct Disposal in Grout. Currently Research and Development (R&D) is being completed on these three alternatives to provide risk evaluations. This will aid DOE's selection of the preferred alternative. R&D work is expected to be far enough along so WSRC will make a final recommendation on the Salt Processing Alternatives in September 1999. DOE-SR plans to make a recommendation in October 1999. A final Record of Decision on the selected technology is scheduled for spring 2000. For the purpose of this System Plan, the documented values (salt solution feed volumes, precipitate feed rates, etc.) from the Small Tank Tetraphenylborate Precipitate process were used for modeling of the HLW System, since it provided conservative estimates for the System.

Defense Waste Processing Facility (DWPF): Pouring problems experienced in early FY97 were corrected by the installation of replaceable pour spout inserts. The insert's service life has been acceptable and insert replacement has been performed without complication. DWPF production has exceeded goal. At the time of this Plan, DWPF had poured 72 canisters vs. a pro-rated goal of 61 (based on a pouring rate of 200 cans per year and planned outages). Current projections indicate that 260 to 290 cans may be poured in FY99. Processing of Sludge Batch 1B sludge began in October 1998.

Glass Waste Storage Building (GWSB): At the time of this System Plan, 554 glass canisters are stored in GWSB #1. This represents approximately 26% of the available 2,159-canister capacity at GWSB#1. Activities to repair the shield plugs for approximately 450 presently unused canister storage locations (included in the GWSB #1 canister capacity value) are planned for FY02 and FY03.

Effluent Treatment Facility (ETF):. In FY98, the ETF treated over 25 million gallons of low-level wastewater, resulting in 202,500 gallons of waste concentrate transferred for storage to Tank 50. For FY99 and beyond, the estimated annual volume of wastewater to be treated is 18 million gallons and the estimated waste concentrate produced is approximately 1% of the wastewater volume or about 180,000 gallons per year.

Saltstone: In FY98 Saltstone completed processing approximately 300,000 gallons of Tank 50 waste inventory and entered a 4-5 year planned lay-up. The facility is planned to restaff in FY02 for an FY04 restart. This will allow deinventory of Tank 50 in preparation for its reuse as a HLW storage tank.

Consolidated Incinerator Facility (CIF): CIF began radioactive operations in April 1997. In September 1998, CIF met a Site Treatment Plan commitment to treat 50% of the non-PUREX legacy mixed wastes by 4Q FY98. Currently CIF is in a characteristic waste campaign treating legacy PUREX solvent in support of a Site Treatment Plan commitment to treat 50% of the PUREX legacy mixed wastes by 4Q FY09. Current plans call for the treatment of around 2,000 gallons of PUREX solvent per year from FY99 to FY09.

1 Description of the HLW System Plan

This Plan describes the strategy for the integrated operation of the HLW System based on allocation of resources to support the processing of 200 canisters per year and starting salt processing activities by mid 2010. The text of this Plan and Appendix H support the Planning Case. In addition, this Plan includes pertinent production planning data in Appendix I for the Requirements Case and Appendix J for the Target Case. Revision 10 of the Plan is developed in conjunction with the budget planning process and is the basis for the Planning Case in the April 1999 "Paths to Closure" submittal.

The HLW System planning bases are described in Sections 1 through 6. Key issues and assumptions are described in Section 7. The production plan is described in Section 8. Sections 9 and 10 highlight technology development needs and potential future missions for the HLW System. The Appendices include supporting tables and figures. Appendix A provides a list of acronyms and Appendix B provides a glossary of terms. Appendix C is a listing of the HLW System Priorities, the basis upon which major funding decisions are made. Appendix D is a simplified HLW process flowsheet. Appendix E depicts the Approved FFA Waste Removal Plan and Schedule. These appendices should be particularly useful to those who are not familiar with this Plan. Appendix F provides perspective on changes in Tank Farm influents and effluents from 1954 to the present. Appendix G was added to illustrate the High Level Waste Tank Usage and depict the Tank Farm space availability. Appendix K provides a brief description of the various components and processes of the HLW System.

One goal of the planning process is to continuously improve the HLW System Plan to better serve the needs of stakeholders. Revision 10 of this Plan incorporates several improvements since Revision 9:

- **ProdMod** is the integrated linear programming computer simulation of the HLW System using Aspen Speedup® software. It was modified to enable planners to incorporate additional inter-tank transfers and evaporation of backlogged wastes, which are now key activities in HLW production planning.
- **Blender Model** was developed to calculate the dynamic tank composition (Sodium, Potassium, Cesium, etc.) for Tanks 4 through 8 and 25 through 50. The composition of a tank changes with time due to addition of new wastes, including: raw waste from canyons, receipt from evaporators, DWPF recycle, ESP spent washwater, tank cleaning washwater, inter-tank transfer waste, etc. Blender Model is a stand-alone FORTRAN based computer program that iteratively uses information from ProdMod, calculates the tank composition, and then feeds the composition back to ProdMod. The Blend Model allows this Plan to better project the out-year salt-blending strategy to meet set feed stream limits.
- Enhancements in reports and models have allowed greater quality control of the varying data inputs and outputs and improved the planning of the various activities in the HLW System.

Several significant activities are ongoing at this time. The FY01 Outyear Budget was developed during this revision of the Plan. A HLW Tank Space Management Team was chartered to complete a Systems Engineering Evaluation to recommend a strategy for maximizing available tank space until the startup of salt processing while continuing safe stewardship of the waste. The results of the evaluation will be incorporated into the next revision of this plan.

HLWD personnel are also supporting activities that could lead to new missions for SRS. DOE-Material Disposition (MD) program activities include possible implementation of a can-in-canister program at DWPF for disposition of surplus plutonium. See Section 10 for further discussion.

2 Mission

The mission of the High Level Waste System is to:

- Safely store the existing inventory of DOE high level waste
- Support critical Site production and cleanup missions by providing tank space to receive new waste
- Volume reduce high level waste by evaporation
- Pretreat high level waste for subsequent treatment and disposal
- Immobilize the low level liquid waste resulting from HLW pre-treatment and dispose onsite as Saltstone grout
- Immobilize the high level liquid waste as vitrified glass, and store the glass canisters onsite until a Federal Repository is available
- Empty and close HLW tanks and support systems per regulatory-approved approach
- Ensure that risks to the environment and to human health and safety posed by high level waste operations are either eliminated or reduced to acceptable levels

That part of the HLW Mission that supports other Site Missions remains a high priority. The Defense Nuclear Facilities Safety Board (DNFSB) 94-1 document contains nine distinct recommendations, the first of which is:

> *"That an integrated program plan be formulated on a high priority basis, to convert within two to three years the materials addressed in the specific recommendations below, to forms or conditions suitable for interim storage."*

The Savannah River Site (SRS) plan to address this recommendation is the Integrated Nuclear Materials Management (INMM) Plan. The System Plan that supports all aspects of the HLW Mission is shown in Appendix H.1-H.9.

3 Purpose

The purpose of this Plan is to document currently planned HLW operations. These operations begin with the receipt of fresh waste, continue with storage, volume reduction, and pretreatment of the waste, and end with the operation of the DWPF and Saltstone. The program will end when all HLW has been vitrified, all HLW facilities have been closed, and all glass canisters have been shipped to the Federal Repository. This document is a summary of the key planning bases, assumptions, limitations, strategy, and schedules for facility operations needed to support the FY01 Outyear Budget. This Plan will also be used as a base document for:

- Developing future budget plans
- Adjusting individual project baselines to match projected funding
- Projecting the Site's ability to support the approved Federal Facilities Agreement (FFA) Waste Removal Plan and Schedule.

4 High Level Waste System Scope

Key HLW facilities and supporting projects are grouped by function in the "Path to Closure" and FY01 Outyear Budget documents as shown below. This includes deactivation and long term surveillance and maintenance of all facilities. The Effluent Treatment Facility, Saltstone Facility, and the Consolidated Incineration Facility are included because of the supporting roles they play for the HLW System.

- SR-HL01: H-Tank Farm
  - *H-Area Tank Farm*
  - *2H Evaporator*
  - *Replacement High Level Waste Evaporator Project (3H Evaporator)*
- SR-HL02: F-Tank Farm
  - *F-Area Tank Farm*
  - *2F Evaporator*
  - *F/H Interarea Line*
- SR-HL03: Waste Removal Operations and Tank Closure
  - *Waste Removal operations*
  - *Waste Removal demonstrations*
  - *Tank Closure projects*
- SR-HL04: Waste Pretreatment
  - *Extended Sludge Processing Facility*
  - *DWPF Feed Storage*
- SR-HL05: Vitrification
  - *Defense Waste Processing Facility operations*
  - *Replacement Melter projects*
  - *Failed Equipment Storage Vault projects*
- SR-HL06: Glass Waste Storage
  - *Glass Waste Storage Building operations*
  - *Glass Waste Storage Building #2 construction*
- SR-HL07: Effluent Treatment Facility
- SR-HL08: Saltstone
  - *Saltstone Facility operations*
  - *Saltstone Vaults operations*
  - *Saltstone Vault projects*
- SR-HL09: Tank Farm Service Upgrades
- SR-HL10: H-Tank Farm Storm Water System Upgrades
- SR-HL11: Tank Farm Support Services F Area
- SR-HL12: HLW Removal
  - *Waste Removal project*
  - *Vitrification upgrades*
  - *Piping upgrades (H-Tank Farm East Hill)*
- SR-HL13: Salt Disposition
- SR-SW01: Consolidated Incineration Facility
- SR-FA24: High Level Waste Facility Disposition

The inter-relationships of these facilities and projects are shown in Appendix D, Simplified HLW Flowsheet Diagram.

5 Planning Methodology

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

5.1 Planning Oversight

Some uncertainty is inherent in this Plan. Actual operating experience in the new processes, emergent budget issues, changes to Canyon production plans, evolution of Site Decontamination & Decommissioning initiatives, and other factors preclude execution of a "fixed" plan. Therefore, DOE Headquarters (DOE-HQ), DOE Savannah River (DOE-SR) and Westinghouse Savannah River Company (WSRC) personnel are continuously evaluating the uncertainties in this Plan and incorporating changes to improve planning and scheduling confidence. WSRC refines and updates this Plan in conjunction with facility operations planning and budget planning.

The **HLW Steering Committee** provides the highest level of oversight of the HLW System. This Committee consists of members from DOE-HQ, DOE-SR, and the WSRC HLW Division. The Committee meets periodically to formally review the status and operational plan for the HLW System. DOE-HQ, DOE-SR, and WSRC HLWD approve the HLW System Plan.

The **HLW Program Board** is a WSRC committee that provides oversight and approval of the HLW System Plan and its schedules. These form the schedule and cost "baseline" for the overall program. Maintenance of the baseline is controlled via a formal change control process.

The **Technical Oversight Steering Team (TOST)** is comprised of senior WSRC professionals and managers from HLW Engineering, the Savannah River Technology Center (SRTC), and HLW Program Management, and provides oversight for resolution of technical issues within the HLWD.

The weekly **HLW Interface Meeting** among HLWD Facility Managers and others ensures that near-term activities impacting multiple facilities are closely coordinated to maximize effective allocation of resources.

The **High Level Waste Management Technology Program Plan (TPP)** describes the integrated technology program plan for the SRS HLW System. The program is based upon the specific needs of the HLW System and is organized following system engineering functions. Specific tasks, funding, deliverables, and milestones are presented for each fiscal year; the plan is updated and issued annually. For additional information on current and planned activities, refer to Section 9, Technology Development.

Waste Acceptance Criteria (WAC) are in place for all waste-receiving facilities. Influent waste streams must be compatible with existing equipment and processes, must remain within the safety envelope, and must meet downstream process requirements.

5.2 Modeling Tools

WSRC uses a family of computer simulations to model the operation of the HLW System. Each model is designed to address different aspects of long range production planning. WSRC uses these models interactively to guide long-range production planning.

The **Waste Characterization System (WCS)** documents the composition of the waste in each of the 51 HLW tanks. Sludge, salt, and supernate are characterized separately. The data encompass 41 radionuclides, 38 chemical species, and 23 other waste characteristics, and come from a multitude of monthly reports, waste sampling results, Canyon process records, and solubility studies. The Waste Characterization System represents the best compilation of SRS HLW characterization to date, and provides a sound basis for production planning analyses. The data for use in this Plan was the WCS datafile of January 22, 1999.

The **Chemical Process Evaluation System (CPES)** is a steady-state model originally developed as a design document for DWPF. The strength of this model is the size of the database it can manage. The current version of CPES tracks 183 chemical compounds in 1,750 process streams connecting over 700 unit operations. Its output consists of a complete tabular material balance for all chemical compounds in each process stream. CPES models waste processing operations for each of the ten sludge batches. Sludge composition varies widely from tank to tank, so CPES uses tank-specific sludge composition data, as defined by WCS. Salt composition, however, is relatively uniform so CPES assumes all salt wastes are blended into an "average salt" composition. CPES reads waste composition data directly from the Waste Characterization System. This allows planners to easily determine how changes in waste composition data will impact sludge batches and subsequent processing in DWPF. In addition, all ten sludge batches used in Revision 9 of the Plan were modeled through CPES, and projected to produce acceptable glass. However, for Revision 10, per the current schedule for salt processing, it has been necessary to resequence some batches. These resequenced batches will be analyzed through CPES and be available in Revision 11 of this Plan.

The **Product Composition Control System (PCCS)** has as its main role the on-line prediction of glass quality in DWPF. It is also used off-line to verify that the Tank Farm waste blends modeled by CPES will be processable in DWPF and will produce acceptable glass. PCCS examines glass property constraints, including liquidus temperature, viscosity, durability, homogeneity, solubility, alumina content, and frit content. PCCS also determines the optimum glass blend to maximize waste loading in glass thereby minimizing canister production for each sludge batch. ESP sludge washing and aluminum dissolution endpoints are established based on CPES and PCCS analyses.

The **HLW Integrated Flowsheet Model (HLWIFM)** is a non-linear, dynamic simulation in Speedup® software that addresses daily variability over a planning period of approximately 3 years. HLWIFM can model transient waste processing conditions (such as tank levels, temperatures, or curie content) against known processing constraints (such as safety parameters, source term limits, operations limits, and regulatory permit requirements).

To expedite modeling of different production planning scenarios, the individual facility modules of the HLWIFM can be run independently. The results of these facility-specific runs are available in seconds, not hours, and are used to optimize facility operations. They are also useful as "real-time" predictive and diagnostic tools while the facility is operating. Facility-specific models have been developed for ESP, the evaporators, and DWPF. HLWIFM also uses the Waste Characterization System as its source of waste data.

The **Production Model (ProdMod)** is a linear equation model that uses the same Speedup® software as HLWIFM. The linear equations used in ProdMod enable it to calculate the entire program in monthly and annual increments, with an approximate one minute run time. This enables planners to quickly evaluate different operating scenarios while still tracking key parameters. ProdMod tracks three key waste constituents:

- Sodium, because it drives the sludge washing operation in ESP
- Potassium, because it determines the amount of precipitate produced by salt processing
- Cesium, because many source term limits are based on cesium concentrations.

ProdMod uses the Waste Characterization System as its source of waste data. The ProdMod data define the programmatic scope in the baseline.

The **HLW System Plan Financial Model** is based on fixed and variable costs. Fixed costs are those costs required to keep a facility in a "hot standby" mode, in which the facility is fully manned with a trained workforce ready to resume production immediately. Variable costs are those costs that vary with production, including: raw materials, repetitive projects such as outfitting tanks with waste removal equipment, replacement glass melters, Failed Equipment Storage Vaults, Saltstone Vaults, some Capital Equipment, etc. Variable costs go to zero if production is zero. The Financial Model is used to determine the long-term cost impacts of accelerating or delaying HLW production schedules. The Financial Model data define the cost baseline for the program.

The WCS, CPES, PCCS, ProdMod, and the Financial Model were used to generate the production planning data contained in the Appendices H through J of this Plan.

5.3 Regulatory Constraints

Numerous regulatory laws, constraints, and commitments impact HLW System planning. The most important are described below.

The SRS **Federal Facility Agreement (FFA)** was executed January 15, 1993 by DOE, the Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC). The FFA, which became effective August 16, 1993, 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 must adhere to a schedule for removal from service and closure. A revised "F/H Area High Level Waste Removal Plan and Schedule (WRP&S)" was submitted to EPA and SCDHEC on January 15, 1998. The WRP&S provides start and end dates for the removal from service and operational closure of each non-compliant tank and commits SRS to remove from service and close the last non-compliant tank no later than FY22. The WRP&S also provides for the possibility that Tanks 4-8 could be used to store concentrated supernate after the completion of bulk waste removal. The reuse of Tanks 6, 7, and 8 are included in this Plan.

The WRP&S was approved by SCDHEC on February 26, 1998 and by EPA on June 22, 1998. The approved WRP&S is an enforceable commitment from DOE to SCDHEC and EPA. Refer to Appendix E to see the approved schedule.

The production plans for the Budget Planning Case and the Budget Requirements Case, as depicted in Appendices H and I of this Plan, meet this commitment. For the Planning Case, meeting the commitment will require renegotiation with SCDHEC to switch the Tank 14 commitment date with the Tank 15 commitment date. The Target Case, depicted in Appendix J, does meet the final commitment date for closing all tanks by FY22. However, it does violate several individual tank commitment dates.

The **National Environmental Policy Act (NEPA)** requires federal agencies to assess the potential environmental impacts of constructing and operating new facilities or modifying existing facilities. Four existing NEPA documents directly affect the HLW System and support the operating scenario described in this Plan:

- DWPF Supplemental Environmental Impact Statement (SEIS)
- Waste Management Environmental Impact Statement (EIS)
- Interim Management of Nuclear Materials (IMNM) Environmental Impact Statement
- Environmental Assessment (EA) for the Closure of the High Level Waste Tanks in F- & H-Areas at the Savannah River Site

An EIS is currently being prepared specific to HLW tank closure. This EIS will provide DOE stakeholders and regulators an additional opportunity to input to the tank closure process (including alternatives). A Record of Decision (ROD) is expected in December 1999.

A Supplemental EIS will be prepared in FY99 specific to the Alternative Salt Disposition project. This SEIS will provide DOE stakeholders and regulators an opportunity to input to the Alternative Salt Disposition process, including alternatives.

The **Site Treatment Plan (STP)** for SRS describes the development of treatment capacities and technologies for mixed wastes. This allows 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. The STP identifies vitrification in DWPF as the preferred treatment option for treating SRS liquid high level waste. It identifies incineration followed by stabilization in the CIF as the preferred treatment option for many mixed wastes.

DWPF has met its STP commitments to submit permit applications, enter into contracts, initiate construction, conduct systems testing, commence operations, and submit a schedule for processing backlogged and currently generated mixed waste. In the schedule submitted to SCDHEC on 5/21/96, SRS committed that:

> *"... After the startup period is complete and DWPF begins full operation, the maintenance of an average of 200 canisters of processed glass per year will be required in order to meet the schedule for removal of backlogged and currently generated waste inventory by the year 2028..."*

In a proposed revision to the STP, DOE is requesting that the above language be revised to read the following:

> *"...Upon the beginning of full operations, DWPF will maintain canister production sufficient to meet the commitment for the removal of the backlogged and currently generated waste inventory by 2028..."*

The production plans for the Budget Planning Case and the Budget Requirements Case, as depicted in Appendices H and I of this Plan, meet this commitment. However, the Target Case, depicted in Appendix J, does not meet these requirements.

CIF has met its STP commitments to submit permit applications, enter into contracts, initiate construction, conduct systems testing, and begin operations. The commitment to submit an LDR waste processing rate schedule was met on October 17, 1997. The schedule commits to a processing completion milestone and several intermediate milestones, based on mixed waste that was in RCRA permitted or interim status facilities as of 9/30/97. Incinerable mixed waste received at RCRA storage facilities after that date is not included in the schedule, but this waste will be accumulated and burned in the appropriate CIF campaign (listed vs. characteristic). On 9/18/98, CIF met the requirement to complete processing of 50% of the backlogged non-PUREX SRS mixed wastes by 4Q federal FY98. Additional near-term schedule commitments for CIF include:

> *"Submit RCRA Part B permit application or permit modification for pre-treatment of non-PUREX SRS mixed wastes by 1Q federal FY2002."*

> *"Complete processing of 50% of the backlogged PUREX waste by 4Q FY2009."*

Receipt and burning of offsite wastes will be reviewed on a case-by-case basis, and requests will be filed with SCDHEC as required by Consent Order 95-22-HW. Offsite quantities are expected to be small, and thus their incorporation should have negligible impact on the treatment schedule for SRS mixed waste.

6 Planning Bases

6.1 Reference Date

The reference date of this Plan is January 22, 1999. Schedules, forecasted budget, milestones, cost estimates and operational plans were current as of that date.

6.2 Funding

The funding required to support this Plan is shown in Appendix H.1 by individual projects. The funding required to support the Requirements Case is shown in Appendix I.1 and the Target Case in Appendix J.1.

6.3 Key Milestones and Integrated Schedule

Key milestones relate to the processes required to remove waste from storage, process it into glass or saltstone grout, and close HLW facilities. Key milestones shown in Table 6-A are supported by the budget as described in Section 6.2.

Table 6–A Key Milestones

Key Milestone	Rev. 9 250 Can Case	Rev. 9 200 Can Case	Rev 10 Planning Case	Rev 10 Requirements Case.	Rev 10 Target Case
• Tank 8 ready to start washing with Tank 40 (Batch#2)	2/99	10/00	7/00	7/00	FY09
• Tank 11 ready for sludge removal (Batch#3)	4/00	6/01	12/01	12/01	FY11
• Initiate RHLWE radioactive operations	6/99	6/99	12/99	12/99	12/99
• Begin GWSB #2 Design & Construction	10/00	10/02	10/02	10/02	FY12
• Complete repair of 450 GWSB #1 Plugs			FY03	FY03	FY03
• Begin GWSB #2 Radioactive Operations	FY05	FY07	FY07	FY07	FY15
• Complete closure of Tank 16	9/02	9/02	9/03	9/03	FY12
• Complete closure of Tank 19	9/03	9/03	3/03	3/03	FY13
• Complete closure of Tank 18	9/04	9/04	3/04	3/04	FY14
• Startup Salt Waste Processing			4/10	4/08	4/10
• Reuse Tank 49 for waste storage			FY03	FY03	No
• Reuse Tank 50 for waste storage			FY06	FY06	No
• Reuse Tank 8 for waste storage	1/01	6/01	FY07	FY07	No
• Reuse Tank 7 for waste storage	FY02		FY08	No	No
• Reuse Tank 6 for waste storage			FY09	No	No
• Reuse Tank 5 for waste storage			No	No	No
• Reuse Tank 4 for waste storage		FY04	No	No	No
• Complete CIF processing of 50% of the backlogged PUREX waste	FY09	FY09	FY09	FY09	FY09
• Waste removed from 24 old-style tanks	FY12	FY14	FY17	FY16	FY19
• Closure complete on all 24 old-style tanks	FY14	FY16	FY20	FY19	FY21
• Sludge Processing Complete	FY17	FY22	FY24	FY24	FY33
• Salt Processing Complete	FY17	FY22	FY26	FY24	FY32
• Start shipping canisters to the Federal Repository	FY15	FY15	FY15	FY15	FY15
• Waste removal complete from all tanks	FY17	FY22	FY26	FY24	FY33
• Complete shipping canisters to Federal Repository	FY25	FY25	FY26	FY26	FY33
• Facility Deactivation Complete	FY25	FY25	FY28	FY27	FY34

7 Key Issues and Assumptions

Key issues affecting the HLW System are described below. Note that the number of issues has increased since the last revision of this Plan. Resolution of each of these issues will have a significant impact on the HLW System for years to come. Each issue has an assumed outcome. Assumptions are therefore listed for each key issue. Potential contingency actions are described, should the assumptions prove to be incorrect.

7.1 Funding Guidance

Issue: The HLW System is especially sensitive to funding in the near term (FY00-FY03) to ensure continuation of DWPF operations and to ensure that salt processing starts up as scheduled. Any delay in operations will extend the end date of the waste removal program and increase life cycle costs by an estimated $450 million dollars per year, in constant FY99 dollars. In FY01 there is a $103 million (in direct dollars) disconnect between the Target and Planning Case funding for the HLW System; namely, the Target Case does not fund operations for waste removal, pre-treatment and vitrification. In the Target Case there will be no canisters produced in the near term. The Target Case does fund safe storage of existing waste and development of the salt processing alternative, but only the Planning Case has funding to operate the HLW System to remove waste and pour canisters. At the current Target level funding guidance, DWPF vitrification will not resume until FY10 when salt processing operations are scheduled to start

Background: Given the recent funding guidance, this Plan presents three funding scenarios:

- Target Case – based on funding guidance
- Planning Case – based on DOE-SR guidance for the FY 2001 Path to Closure submittal
- Requirements Case – shows funding required to cost-effectively operate the HLW System.

The annual canisters filled, regulatory commitments impacted, and program end dates for each funding case are described in the Plan.

Assumptions: This Plan compares all three funding scenarios, however, it is written based on Planning Case funding.

Contingency: Depending on funding, the HLW System funding will go first to safe storage of waste, then to salt alternative processing and then to operations to remove and process waste.

7.2 Age of the HLW Facilities

Issue: The material condition of many HLW facilities constructed from the early 1950's to the late 1970's is deteriorating.

Background: The following are examples:

- A transfer line secondary containment encasement in F-Area failed in one place and is leaking in several others. This line was taken out of service.
- Groundwater intrusion into Tank 19 has been observed.
- Numerous carbon steel leak detection systems failed and had to be repaired before transfers could be made.
- Routine repairs to service systems in the F and H-Area Tank Farms have escalated into weeks of unplanned downtime due to obsolete instrumentation and the poor condition of the service piping.

In many cases, waste cannot be transferred out of tanks unless temporary services are installed or emergency measures are taken. Aging facilities cause excessive unplanned downtime and 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. It should be noted that the Tank Farm can't be "shut down" as it contains approximately 34 million gallons of highly radioactive waste, much of which is in a mobile form.

Assumptions:
- An H-Area secondary containment encasement (similar in design and vintage to the failed F-Area encasement) will not fail and the H-Area Type IV Tanks will not leak or fail.
- Sufficient funding will be allocated for maintenance of the Tank Farms, and planned Line Item projects will remain on schedule to help refurbish and preserve the Tank Farm infrastructure. These projects include:
  - Tank Farm Services Upgrades (HTF West Hill) FY96-FY99
  - Tank Farm Storm Water Upgrades FY98-FY00
  - Tank Farm Support Services (FTF) FY99-FY02
  - Piping Upgrades (HTF East Hill) FY01-FY05
- Leak detection piping and systems will continue to be repaired as needed

Contingencies:
- Accept a slowdown of the HLW Program and increased life cycle costs to reallocate funding to the Tank Farm infrastructure.
- Accept increased environmental risks as tank infrastructure systems age.
- Obtain additional funding.

7.3 Age of the HLW Tanks

Issue: SRS's 51 underground HLW storage tanks are intended for interim liquid waste storage only. The oldest of these tanks have already been in service for more than 40 years. Eleven of these tanks have a leakage history. Continued storage of liquid waste in these tanks poses a potential threat to the environment.

Background: The first SRS HLW tanks were put into service in the early 1950's. Twenty-four of the 51 tanks are considered "old-style" tanks and do not meet current requirements for secondary containment and leak detection. DOE has enforceable commitments to SCDHEC and the EPA to close these "old-style" tanks (see Appendix E). Two of the tanks (Tanks 17 and 20) have already been closed. Many of the tanks are in or near the water table. Approximately 34 million gallons of high level waste is stored in the Tanks Farms, much of it in a mobile form.

Per this Plan, many of these tanks will be over 50 years old before they are closed. In the last 2 years, two additional tank integrity issues have arisen with these tanks.

- Tank 15 has developed a type of leak site not previously seen: a crack running parallel to a weld seam, above the waste level, approximately 18 inches in length. This type of leak site will make waste removal from this tank much more difficult. If other tanks develop similar cracks, the risk of releases and the complexity and cost of future waste removal will be increased.
- Increased corrosion has been observed in several tank secondary pans. These secondary pans, which represent the last line of defense for this waste, already contain waste from previous leaks in the primary walls of the tanks.

Although SRS maintains an aggressive program to monitor the integrity of all waste tanks, these recent findings underscore the need to fund Tank Farm infrastructure projects and also to complete waste removal from these tanks as soon as possible.

Assumptions:
- Successful waste chemistry controls, temperature controls, and construction stress-relief methods will prevent new leak sites.
- Rigorous tank inspections will monitor known leak sites and detect any new leak sites, if they occur, so that appropriate compensatory actions can be taken.
- Resources will be available to continue to remove liquid waste from underground tanks, thereby significantly reducing the environmental threat posed by storage of liquid high level waste in underground tanks

Contingency:
- Maintain emergency storage capacity in the Tank Farms to accommodate transfer of waste from a leaking tank, if a leak occurs.
- Accept increased environmental risks as tank systems age.
- Obtain additional funding.

7.4 Tank Farm Waste Storage Space

Issue: The Tank Farms' useable waste storage space is continuing to be consumed by delays in the start of salt processing, planned long term sludge-only DWPF processing, and continued receipts of Canyon wastes. If salt processing is delayed until FY10 and the waste generating facilities perform as planned, then the Tank Farm waste inventory will exceed the storage capacity in Type III tanks (currently designated for waste storage) by FY03. Insufficient waste storage space will impact the Tank Farms' ability to support operations in DWPF and the Canyons or lead to adding concentrated waste to alternative storage locations (e.g., old-style tanks).

Background: All parts of the HLW System at SRS are operational except the salt processing plant. Work on salt processing was suspended in January 1998, due to technical issues with the In-Tank Precipitation (ITP) Facility. Since January 1998, a rigorous systems evaluation has been completed on all available salt processing technologies and Research and Development for process selection is currently being completed on the most promising alternatives. By the end of 1999, DOE will have selected the preferred technology for the new salt processing plant; a final Record of Decision on the selected technology is scheduled for spring 2000. Based on the HLW Salt Disposition Systems Engineering Team recommendations and the expected funding profile, salt processing will be delayed until FY10. DWPF is expected to continue sludge-only operations until salt processing startup. It must be remembered that no space is gained from sludge removal, as it is a minor component of the total space in use in the Tank Farms. In addition, almost all of the sludge processed prior to FY10 is currently stored in non-compliant tanks. Salt and supernate removal is the only process that truly gains space in the Tank Farm. As a result, the Tank Farms must continue to process the significant DWPF recycle and ESP washing streams within existing space limitations.

With the delay in Salt Processing from FY02 to FY10 a HLW Space Management (SM) Team has been chartered to recommend the best management practices for safe stewardship of high level waste while maximizing available tank space. The SM team is expected to issue a final report in the fourth quarter of FY99. The results of this report will be incorporated into the next revision of the Plan.

At the time of this Plan, F-Tank Farm has ~300,000 gallons of useable space available, and H-Tank Farm has ~1,500,000 gallons of useable space available. Working inventory must be maintained in the Tank Farms to receive large volumes of new waste (*e.g.* ESP wash water)

Assumptions:

- The Canyon's waste stream volumes and the DWPF recycle volumes will be less than or equal to the forecast.
- The 2H and 2F Evaporators will operate as planned and achieve their space gain goals.
- The RHLWE will start up in December 1999 and operate as planned.
- DWPF recycle will be concentrated to 8 molar hydroxide, which will minimize formation of salt solids in Tank 38.
- The backlog of dilute supernate currently stored in H-Tank Farm Type III tanks can be successfully retrieved and evaporated as a means to recover space in the Tank Farms.
- Tanks 49, 50 and old-style tanks 6, 7, and 8 will undergo required modifications to allow their return to waste storage service.

Contingencies:

- The HLW Space Management Team may recommend new strategies that increase available space.
- Salt processing may resume before FY10. HLW System attainment could be decreased.
- Planned Canyon programs could be slowed down until the Tank Farms are in a better position to support them.
- DWPF and ESP water washes could be shut down to reduce feed streams.

7.5 Reduced Minimum Working Space

Issue: The Tank Farm minimum working space required to make transfers and operate evaporators is currently defined to be 800 kgal which is less than the 1,000 kgal used in HLW System Plan, Rev. 9. This Plan currently allows the Tank Farm Useable Space to come near the defined minimum working space level before taking credit for new space being made available from alternative space sources (See Appendix H.8). Planning to operate near the minimum working space level severely restricts the ability of HLW to efficiently support Site missions.

Background: The current minimum HLW Tank Farm working space is defined as the volume reserved for waste receipts and evaporator operations, currently 200 kgals per evaporator system and 100 kgals per area for waste receipts. Presently this has been defined to be 500 kgals for H Area and 300 kgals for F Area. When the Available Space value in the Tank Farm approaches the Minimum Working Space value, then processing capabilities are significantly limited.

For example, if the Useable Space in the Tank Farm is at or near the working space level at the time that a 300 – 400 kgal wash water transfer must be made from ESP, then the ability to support the transfer may be in jeopardy. The exact impact may depend upon where the space exists in the Tank Farm. If the working space is not in tanks where we would want to send the ESP wash water for processing, then ESP washing process may be delayed and a resulting impact on DWPF feed availability will occur.

Another example would be if an extended unplanned evaporator outage were to occur at the same time that the Useable Space was at or near the minimum working space level. The Tank Farm would be unable to recover space and all influents streams would have to be shut off or severely restricted until enough space had been recovered to resume normal processing. The Tank Farm must ensure that the required emergency space levels are not violated.

The SM Team mentioned under Section 7.4 is also addressing this issue. The assumptions used to determine the 800 kgal minimum working space level will be evaluated and a recommended change, if required, will be documented.

Assumptions:

- The HLW System can operate as planned at a Useable Space level near the defined minimum working space level.
- The Canyon's waste stream volumes and the DWPF recycle volumes will be less than or equal to the forecast.
- The Evaporators will operate as planned and achieve their space gain goals.
- The backlog of dilute supernate currently stored in H-Tank Farm Type III tanks can be successfully retrieved and evaporated as a means to maximize space in the Tank Farms.
- Tanks 49, 50 and old-style Tanks 6, 7, and 8 will undergo required modifications to allow their return to waste storage service.

Contingencies:

- The HLW SM Team may recommend a new strategy that increases available space.
- HLW System attainment could be decreased.
- Planned Canyon programs could be slowed down until the Tank Farm is in a better position to support them.
- Tanks 49, 50 and old-style tanks could be made available for reuse earlier than currently planned.
- DWPF processing and ESP water washes could be slowed down or shut down to reduce feed streams.

7.6 Return of Tank 49 to Waste Storage Service

Issue: If salt processing is delayed until FY10 and the waste generating facilities perform as planned, then the Tank Farm waste inventory will exceed the storage capacity in Type III tanks (currently designated for waste storage) by FY03. The plan is to add concentrated supernate to Tank 49 starting in FY03. The disposition of benzene bearing solutions currently stored in Tank 49 has not been determined.

Background: Tank 49 was previously part of the ITP process where it was to be used as a precipitate feed tank for DWPF. It currently contains approximately 106 kgal of benzene bearing solution from ITP demonstration runs that must be removed prior to its return to waste storage service. Physical modifications to transfer lines must also be made. Tank 49 must be tied back into transfer lines to HDB-7 and ties to the Late Wash Facility must be disconnected.

Assumptions:

- Existing benzene laden solution in Tank 49 can be adequately dispositioned.
- Modifications required at the tank can be made.

Contingencies:

- The HLW Space Management Team may recommend new strategies that increase available space.
- Begin storage in old style tanks prior to returning Tank 49 to waste storage service

7.7 Return of Tank 50 to Waste Storage Service

Issue

If salt processing is delayed until FY10 and the waste generating facilities perform as planned, then the Tank Farm waste inventory will exceed the storage capacity in Type III tanks (including Tank 49) by FY06. The plan is to add concentrated supernate to Tank 50 starting in FY06. Before using Tank 50 for waste storage, a new ETF concentrate receipt methodology for Saltstone will be required. The physical modifications required for ETF concentrate to be fed directly to Saltstone must also be defined.

Background:

Tank 50 was used as a part of the ITP process where it stored the low activity filtrate stream for feed to the Saltstone Facility. It is currently used to receive and store ETF concentrate that will eventually be fed to Saltstone. Physical modifications will be required at Tank 50 to tie transfer lines back into HDB-7 and to disconnect transfer line tie-ins to ETF and Saltstone. Shielding upgrades must be made to the Tank 50 valve box and at slurry and transfer pump spray chambers to allow Tank 50's use for concentrated supernate storage versus the low activity material that is currently stored.

From FY99 – FY03, the existing Saltstone facility will be in a "partial lay-up" mode, and will not operate. During this period, Tank 50 will continue dedicated service as a receipt tank for the ETF evaporator concentrate. In FY04, the Saltstone facility will resume operations to process Tank 50's accumulated inventory. Since Tank 50 will be required for concentrated waste storage service, Saltstone must be maintained in an operational mode and modifications made to handle the receipt of direct transfers of concentrate from ETF. A new storage tank located at Saltstone may be required to optimize processing with the projected low annual ETF concentrate stream (~180 kgal/yr) until Salt Processing begins operation. A new Saltstone operational strategy must be developed to balance Saltstone processing versus planned receipts.

Assumptions:

- Adequate funding and resources are available to startup and operate Saltstone in FY04 to process accumulated ETF concentrate stored in Tank 50.
- After processing the Tank 50 material, Saltstone processing will be maintained at a rate to support continued direct ETF concentrate receipts.
- Physical modifications can be made to support concentrated waste storage in Tank 50 and the direct receipt of concentrate from ETF to Saltstone.

Contingencies:

- The HLW Space Management Team may recommend new strategies that increase available space.
- Begin storage in old style tanks prior to returning Tank 50 to waste storage service.
- Alternative method for handling ETF concentrate can be determined so that it is not processed at Saltstone.

7.8 Transferring Waste Into Old-Style Tanks

Issue:

If salt processing is delayed until FY10 and the waste generating facilities perform as planned, then the Tank Farm waste inventory will exceed the storage capacity in new-style tanks, including Tanks 49 and 50, by FY07. The plan is to add concentrated supernate back to Tanks 4-8 starting in FY07.

Background:

SRS has established an expectation with stakeholders that once waste is removed from old-style tanks, those tanks will be closed and not reused. However, in order to continue to support Canyon and DWPF operations prior to salt processing operation, some old-style tanks will be re-used for waste storage.

All 24 of the old-style tanks were evaluated, and most were eliminated from consideration. Tanks 1, 9-16 and 19 have a leakage history. Tanks 2 and 3 lack a viable inlet transfer route and are filled with salt. Tank 17 is closed. Tank 18 is the only route by which waste in Tank 19 can be removed. Tank 20 is closed. Tanks 21-24 are still in active service for storage of low activity waste. However, Tanks 4-8 could be used. The F/H Area High-Level Waste Tank Farm Partial Permit to Operate, Special Condition #11, states that:

"Based on a review of the Tank Assessment Report ... the Type I tanks identified as tanks 2-8 are approvable as equivalent devices for secondary containment. The Type I tanks, however, should only be used for waste receipt when there is no suitably available volume in an approved Type III tank."

Some Type III tank space would be maintained, including the 1,300 kgal emergency space in each Tank Farm as required by the TSR, and the minimum working space of 800 kgal needed to operate the 2F, 2H, and 3H evaporators. Given the latest Canyon waste and DWPF recycle forecasts, all remaining Type III tank space will be consumed in FY07. The need to store concentrated waste in Tanks 4-8 has been discussed with SCDHEC, and is included in the Approved FFA Waste Removal Plan and Schedule.

Assumptions:

- The existing backlog of dilute supernate will be concentrated to the extent possible during FY99-FY01.
- Tanks 4-8 will not fail.
- Concerns about adding liquid to dry sludge in Tank 5 can be resolved.
- Funding and resources will be available to make necessary upgrades in these tanks These may include
  - installing modified leak detection systems and seal plates in valve boxes
  - refurbishing ventilation systems
  - repairing or upgrading pumps and annulus jets
  - upgrading services
  - installing waste inlet pipes and valves to prevent inadvertent transfers, etc.
- Some concentrated supernate can be stored in old-style tanks.
- Tanks will not be used for concentrated supernate until after existing sludge has been removed.
- The reduced fill limit for Type I tanks (no leak sites identified) is 500 kgal based on tank structural integrity issues resulting from the Tank 15 crack propagation study.

Contingencies:

- Canyon and DWPF operations could be slowed or stopped commensurate with Tank Farm waste storage capacity.
- Low activity waste (<5 Ci/gal) could be added to Tanks 21-24.
- Salt processing may resume before FY10.
- The HLW Space Management Team may recommend a new strategy that increases available space.

7.9 Tritiated Water

Issue: The WSRC self imposed administrative ETF release limit for tritium was reduced. It is now at a level that will challenge HLW, SFS, and NMSS to control the effluent of tritium to ETF without adversely effecting normal operations in these facilities. To maintain adequate useable space in the Tank Farm, for the next few years this Plan relies on space gained from evaporation of backlogged waste that contains higher levels of tritium.

Background: The WSRC self imposed administrative ETF release limit was reduced from 45 curies/day to 5 curies/day of tritium to accommodate a processing concern encountered by ETF in September of 1998. The 5-curies/day limit was established based on historical data during a period that did not include the typical processing of high-heat backlog waste. This did not allow normal evaporator operation in F-Tank Farm because the overheads produced by the 2F evaporator system processing high-heat waste exceeded the ETF release limit for tritium. The 2F evaporator was forced into an outage for approximately 6 weeks. During this time a task team was assembled to analyze the problem and recommend solutions to the Senior Site ALARA committee. The team demonstrated that the 5 curie/day limit was not reasonable with respect to processing high-heat backlog waste or the waste expected from dispositioning of backlogged fuel assemblies by NMSS. The ALARA committee agreed to raise the ETF tritium release limit to 20 curies/day allowing the 2F Evaporator to return to normal operation. This level is still well below safe drinking water limits. However, planned future evaporation of backlogged waste in Tanks 30, 32, 35 and 39, new Canyon waste, and the

NMSS processing of backlogged fuel assemblies will most likely challenge the 20 curies/day tritium release limit at ETF.

A second tritium task team consisting of members from HLW, NMSS, ETF and SFS has been formed to look at our processes and attempt to predict and "level load" the effluent of tritium to ETF. The team has recommended a higher ETF tritium limit of 30 curies/day to the Senior Site ALARA Committee. The higher limit, along with tighter controls, good communications, and integration of our processes should allow this Plan to be executed per schedule.

Assumption:

- Operating schedules can be adjusted to "level load" the tritium effluent to ETF to an acceptable level.
- Concurrence can be gained from the Senior Site ALARA committee to raise the ETF release limit to a level that allows the facilities to operate on a "normal" schedule that optimizes Tank Farm space gain initiatives.

Contingencies:

- The HLW Space Management Team may recommend new strategies that increase available space.
- Salt processing may resume before FY10.
- HLW System attainment could be decreased.
- Planned Canyon programs could be slowed down until the Tank Farm is in a better position to support them.
- Concentrated supernate could be added to old-style tanks.
- DWPF and ESP water washes could be shut down to reduce feed streams.

7.10 Salt Processing Disposition and Resumption of Operations

Issue: DOE has not made a final decision on the process to treat HLW salt solutions. Conclusions and recommendations made in this Plan can be significantly impacted depending on the final alternative selected and its associated startup date.

Background: All parts of the HLW System at SRS are operational except the salt processing plant. Work on salt processing was suspended in January 1998, due to technical issues with the In-Tank Precipitation (ITP) Facility. Since January 1998, a rigorous systems evaluation has been completed on all available salt processing technologies, and Research and Development for process selection is currently being completed on the most promising alternatives. By the end of 1999, DOE will have selected the preferred technology for the new salt processing plant and a final Record of Decision on the selected technology is scheduled for spring 2000. Based on the HLW Salt Disposition Systems Engineering Team recommendations and the expected funding profile, salt processing will be delayed until FY10. DWPF is expected to continue sludge-only operations until salt processing startup. Per a May 1999 DOE-HQ decision, a new strategy for alternative salt processing will be developed. The impacts of this directive have not been incorporated into the development of this Revision of the Plan.

At a planned production rate of 200 canisters per year, this Plan shows the need to produce salt only canisters for the last 2+ years of the program. The production of salt only canisters will require additional evaluation to ensure a glass can be made that meets requirements (durability, heat loading, etc.). Development of a glass formulation with new frit and/or new glass forming chemicals will be required. The potential impact of the salt only canisters on the Glass Waste Storage Building must also be evaluated.

Assumptions:

- This revision of the Plan does not have the benefit of a final decision by DOE on the process to treat HLW salt solutions. Therefore, this Plan uses the values (salt solution feed volumes, precipitate feed rates, etc.) from the Small Tank Tetraphenylborate Precipitate Salt Disposition alternative proposed by the HLW Salt Disposition Systems Engineering Team. The Small Tank alternative is considered to be bounding of the three alternatives still under evaluation. Once a final decision is made on the preferred salt disposition process, a new revision of this Plan will be generated.
- Production of salt only cans will not impact processing plans.

Contingency:

- Shutdown all DWPF processing if alternative useable tank space is not made available above that identified in this Plan (i.e. new waste tanks).

- The HLW Space Management Team recommends a new strategy that significantly increases available space.
- Salt processing may resume before FY10.

7.11 Key HLW Processing Parameters Uncertainty

Issue: Subtle changes in a few key waste characteristics could dramatically impact HLW process planning and the overall length of the HLW Program.

Background: This Plan assumes that most of the aluminum in the sludge is in the form gibbsite, $Al(OH)_3$, which is soluble in a 3 molar NaOH solution, and can be removed by the aluminum dissolution process at ESP. However, some could be in the form of boehmite, AlO(OH), or aluminum silicates, which do not dissolve completely, and therefore would not be removed in ESP. This could impact processing in DWPF as well as the total number of canisters produced. This Plan assumes that 2 wt% insoluble solids are entrained in saltcake. If the actual amount is higher, then more canisters of glass will be produced. This Plan assumes that the accepted total potassium inventory in the Tank Farms is well defined. An increase in potassium will drive increases in total precipitate production.

This Plan also assumes the accepted weight % solids in settled sludge are well known. An increase in the weight % solids will result in more canisters of glass being produced. A change in the weight % solids variable has already been seen in Sludge Batch 1A and resulted in a revision to the canister yield.

A Flowsheet Team reporting to HLW Engineering has been established to coordinate process interfaces and process chemistry internal to HLW and between HLW and Separations. This team has been established to ensure that changes to key parameters (waste inventories and composition, modeling tool changes, modeling assumptions, etc.) that impact HLW System Planning are agreed upon by all applicable parties before they are implemented. A primary purpose of this new team is to communicate key information so that all facilities are using the same data or assumptions for operating or planning activities.

Assumptions: Waste sample analyses are being refined to obtain additional needed information without increasing the number of samples. Sample results will confirm the waste composition and characteristics described above. Operating experience in facilities throughout the High Level Waste System will improve our understanding of the relationships among waste composition, waste characteristics, and waste processing. In particular, the upcoming sludge removal activities on Tank 8 and sludge washing of Batch 2 will allow a comparison of forecast versus actual inventory data for these tanks. Facility processes will be adjusted as necessary. Actual Sludge Batch 1A processing data has allowed us to better predict production information for future batches. Blending of feed to Salt Disposition and ESP will compensate for any transient (high or low) conditions in individual waste tanks.

Contingencies:

- Additional waste tank samples could be retrieved and analyzed.
- Additional processing data will provide better information for future System Plans.
- Modifications to some facilities could be required.
- The total number of canisters to be produced may increase.
- The overall High Level Waste program could be lengthened.

7.12 Maintaining Continuous Sludge Feed to DWPF

Issue: Current funding constraints in the FY00 President's Budget and guidance for FY01 have required difficult decisions in the planned HLW operating strategy, particularly with regard to the process of DWPF feed preparation. Based on current DOE funding guidance, the schedules to maintain continuous sludge feed to DWPF require just-in-time completion dates for Sludge Batches #3 (Tanks 7, 11) and #4 (Tanks 4, 7, 15, 18 and 19). Waste removal and feed preparation, given the state of legacy high level waste now in the tanks, is a first-of-a-kind process abundant with challenges and uncertainties.

Background: For work recently completed on Tank 8 in preparation for waste removal, there has been an extraordinary amount of emergent work related to the poor condition of the tank, tank-top equipment and supporting services. There have been significant Lessons Learned obtained from Tank 8 preparation work that will be factored into future waste removal tanks, where possible. However, low funding levels in FY00 for Tanks 11 and 7 moved much of the construction scope into FY01. This leaves minimal schedule contingency time for recovery from unexpected delays as were experienced on Tank 8 (tank riser interferences, high radiation rates, waste characterization issues, etc.).

The increase in projected canister yield (428 cans to 600 cans) for Sludge Batch 1B has helped to offset the funding impacts on feed preparation. This increase in canister yield resulted from two factors:

- After slurry pump replacement, a larger amount of sludge solids existed in Tank 51 than was originally forecast
- It was possible to move a greater amount of sludge from Tank 42 to Tank 51 than was originally planned.

However, these projections have already been factored into the schedule used for this Plan and any unexpected delays in feed preparation will impact sludge feed availability.

Assumptions:

- Sludge Batches #1B and 2 will perform as projected.
- There will be no major, unexpected delays in future Sludge Batch feed preparation.
- WSRC will be able to improve subsequent Sludge Batch schedules to sustain a production rate of 200 canisters/year.

Contingencies:

- Any unplanned DWPF outage may reduce the schedule imbalance.
- The DWPF production rate could be reduced.
- An extended outage could be planned.

7.13 TSR Implementation: Scope and Schedule

Issue: Completion of the SAR and TSR upgrades to F- and H-Area Tank Farms will require significant manpower resources. Implementation of a revised Authorization Basis (AB) program is complete in H-Tank Farm, and is ongoing in F-Tank Farm. Interim Systems, Structures, and Components (SSC) functional classification upgrades have been instituted; however, final equipment functional classification and backfit analyses could result in future TSR changes and additional equipment upgrades. Implementation of TSRs is also expected to cause increases in some routine operations and maintenance costs.

Background: In the past, the Tank Farms' Authorization Basis relied heavily on administrative programs. The new methodology requires significantly more safety-related systems and programs to provide adequate protection. Achieving compliance with the new AB documents will require implementing a comprehensive program addressing Limiting Conditions of Operation (LCOs), administrative controls incorporating Process Controls of Operation (PCOs), surveillance requirements, mode change check lists, integrated operating procedures, training and compliance verification.

Dedicated, interdisciplinary teams representing Engineering, Operations, Procedures, Maintenance and Training are working to develop and implement Technical Safety Requirements (TSRs) in both H & F Tank Farm Facilities. Implementation is complete in H-Tank Farm as of 4/29/99 and planned for F-Tank Farm to be complete by 8/31/99.

Implementation of the upgraded AB in both H and F-Tank Farm facilities constitutes completion of Phase III as part of a four phase approach to achieve a fully compliant AB. Phases I and II implemented interim OSR requirements, LCOs, and component functional classification upgrades. Phase III, when completed, will consolidate several AB documents (SAR, BIO, JCO, and OSRs) in a single SAR and TSRs.

Phase IV is discussed in Section 7.14 below.

Assumptions: Adequate manpower and funding resources will be applied to support the program.

Contingencies:

- If resources are not available, and Phase III implementation is not completed for F-Tank Farm, H-Tank Farm operations will continue under the revised SAR and TSRs (Interim AB). This will continue until scope or resource availability is adjusted to facilitate implementation of all attributes necessary to achieve full completion of Phase III in all CST facilities.
- HLW System attainment could be slowed to make resources available to support the TSR program.

7.14 Authorization Basis Document Upgrades

Issue: The effort to finalize the development and implementation of Authorization Basis (AB) documents that reflect all the requirements of DOE Orders 5480.22 and 5480.23 for F- and H-Tank Farms and the WPT Facilities is currently unfunded.

Background: Bringing the F- and H-Area Tank Farms and the WPT Facility into full compliance with DOE Orders 5480.22 and 5480.23 will require significant manpower resources, and may require capital upgrades to these facilities. Completion of analysis to the standards specified in DOE Order 5480.23 for the Tank Farms will require additional funding. In addition, equipment upgrades or new systems may be required to meet Evaluation Guides for reduction of risk in each facility. Additional hardware modifications and training, procedure, and surveillance revisions will be necessary to comply with DOE Order 5480.22.

AB upgrades will provide an improved safety basis for the Tank Farms and WPT operations. However, additional resources must be applied to develop and implement these AB upgrades, due to analytic requirements and controls that are more stringent. The upgrades for the Tank Farms consist of the following:

a) Update of the hazards analysis is required to incorporate facility worker hazards not previously assessed. New analysis for facility worker hazards not previously analyzed and review of existing accident analysis is required. This is to ensure that all hazards to the public, facility workers, and the environment associated with facility operations have been identified and assessed for impact. This analysis ensures that safety functions are identified to prevent and/or mitigate the consequences of each accident.

b) Derivation of controls is required to finalize the selection of systems, structures, and components (SSCs) controls or administrative controls to perform the safety functions that prevent or mitigate the accidents. Controls can be existing controls or, when existing controls are inadequate or overly burdensome, newly developed equipment designed to perform the safety function. Development of new equipment can represent a significant cost, due to both the stringent and exacting requirements associated with safety class or safety significant classification and the number of tanks involved.

Associated with derivation of controls is the completion of uncertainty analysis. This analysis is conducted to ensure that instrumentation utilized for prevention and mitigation of accidents operate in compliance with assumptions in the accident analysis.

c) Final functional classification is required to ensure that the facility SSCs selected to prevent and/or mitigate the accidents are capable of performing their safety function when needed. For safety class and safety significant equipment, this effort is conducted using the Backfit process described in procedure ENG.12. Necessary actions resulting from the backfit process can include replacement, modification, and/or testing of SSCs. In addition, the functional classification of SSCs as safety class or safety significant imposes an additional burden on the operation and maintenance of the equipment.

d) Procedures and training that reflect the revised AB must be developed. These efforts represent a large impact on resources.

A compliant SAR and TSRs were previously prepared for the WPT Facility. The effort associated with this facility is to modify the SAR and TSRs to reflect the non-operational precipitation process, followed by development of procedures and training to reflect the revised AB. In addition, although the backfit analysis was completed for the affected SSCs, some action items must be completed.

Assumptions: AB upgrade and implementation may be deferred until sufficient funding is allocated.

Contingencies:

- F- and H-Tank Farm operations will continue under the revised SAR and TSRs (Interim AB). This will continue until scope or resource availability is adjusted to facilitate implementation of all attributes necessary to achieve full implementation of DOE Orders 5480.22 and 5480.23 in all CST facilities.
- HLW System attainment could be slowed to make resources available to support the TSR program.

7.15 Control Systems Obsolescence

Issue: Most of the HLWD's process control computer systems are nearing the end of their useful life. They require replacements or upgrades to both hardware and software in order to continue to provide the necessary reliability and availability to support the defined HLWD mission.

Background: The control systems in HLWD are currently obsolete or will become obsolete within the next few years. The main exceptions are some of the Programmable Logic Control (PLC) Systems in the Defense Waste Processing Facility (DWPF) and the Pulse Height Analyzers. The number of systems no longer supported by the original vendors has increased significantly. This is due to the increasing rate of change in the computing industry and the efforts to utilize an increasing number of commercially available products, both hardware and software.

Because of the obsolescence of the equipment and software, system reliability has declined, outages are occurring more frequently and overall system operation and maintenance costs are increasing. Spare parts are no longer available in many cases; spare parts that are available are increasingly difficult to obtain and repair. The variety of options to replace system components is severely limited by the cascade effect of dependencies between newer hardware and software; replacement of a single device may require a complete system replacement. Finally and most critically, the technical expertise available from the vendors and from the current staff is rapidly declining since training on obsolete components is not available.

The obsolete systems to be addressed include all of the process control systems (e.g. Distributed Control Systems [DCS]), the process support systems (e.g., Process Information Management Systems [PIMS]) and facility support systems (e.g., Access Control System [DEPAS]). Highest priority must be given to renovating those systems related to human health, safety, and the environment, followed by those impacting facility operations.

Assumptions: Funding can be made available to upgrade affected systems before spare parts, expertise, or failure causes a shutdown.

Contingencies:

- Engineering could develop manual operating capability to allow removal of automatic control completely.
- Major facilities could be shut down until upgrades can be funded.

7.16 Year 2000 Compliance

Issue: Most of the HLWD's computer systems have completed the necessary "Year 2000 (Y2K) Remediation," and are expected to function properly after January 1, 2000. No impact is expected on the operation of HLWD processes. While every effort has been made to renovate all identified systems vulnerable to a Y2K related failure, some systems may be subject to failure. This could include key suppliers.

Background: Extensive efforts over the past two years have replaced or repaired most Mission Essential systems within the division. Renovation of the systems not yet completed is expected by August 1999. In addition, renovation of all of the Non-Mission essential systems is anticipated by the end of October 1999. Finally, extensive contingency planning will address potential system failures, including key suppliers

Assumptions: Processing capabilities will not be impacted by Y2K.

Contingency: Contingency and Transition Planning will be completed to minimize the impacts of failures.

8 Integrated Production Plan

8.1 Overview

The following integrated production plan supports production of 250 canisters in FY99, 200 canisters per year starting in FY00 and continuing through FY24, and 60 canisters per year of salt-only cans in FY25 and FY26. However, note that successful implementation of this production plan is contingent upon:

- Availability of funding as shown in Appendix H.1
- Successful performance of waste removal projects in the Tank Farms
- Successful sludge batch preparation in ESP
- Successful implementation of the Alternative Salt Processing Facility with a startup in FY10.

The FFA commitment for closure of Tank 14 and Tank 15 will need to be switched by agreement with SCDHEC. This will allow all of the Approved FFA Waste Removal Plan and Schedule commitments to be met. The HLW funding required to support the Planning Case is shown in Appendix H.1.

This section describes the effect of each influent and effluent stream in the Tank Farms, and its impact on Tank Farm operations. Sections 8.2 through 8.10 describe the production requirements for each HLW facility to support this Plan.

8.1.1 HLW System Material Balance

The Tank Farm Material Balance, shown in Appendix H.3, is the key tool used to develop this Plan. The balance between influents to the Tank Farm and effluents to DWPF, Saltstone, and the Effluent Treatment Facility is critical during the next ten years due to the current low Useable Tank Space in the Tank Farms. The lack of tank space impacts the ability to receive influents from the Canyons and DWPF and to store salt concentrate from the evaporators. A review of some terms used to define tank space and some detailed discussion on forecasted influents and effluents and their impact on the HLW System is provided below.

Useable Tank Space (or Working Inventory): 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 "Useable Tank Space". The Useable Tank Space has the following distinctives:

For planning purposes, the maximum capacity (**Tank Operating Limit**) of the Type III and Type IIIA tanks is assumed to be 1,270,620 gallons, which is 35,100 gallons less than the TSR limit of 1,305,720 gallons. The only exceptions to this are the 2F and 2H Evaporator feed tanks, Tanks 26 and 43, in which the Operating Limit is 1,228,500 gallons, due to the elevation of the evaporator feed pump motor.

The old-style (Types I, II, & IV) tanks (Tanks 1-24) are excluded because they do not meet current requirements for secondary containment and leak detection, with the exception of dilute waste handling in Tanks 21-24. The Tank Farm Industrial Wastewater Operating Permit does not allow waste to be added to tanks that currently leak or have leaked. Tanks 4-8 may be used to store concentrated waste in the future, but field modifications will be required before those tanks can be used. Therefore, they are not included in the "Useable Tank Space" at this time.

Tanks 48, 49, and 50 are excluded, at this time, primarily because unplanned additions of large waste volumes would alter the waste composition. This would possibly violate strict process chemistry controls, and may impact the ability to efficiently implement a salt processing alternative. Tanks 49 and 50 are planned to store concentrated waste, but field modifications will be required, technical issues must be resolved and processing impacts must be assessed before returning these tanks to waste storage service.

ESP Tank 51 is excluded from the Useable Tank Space calculation because unplanned additions of waste would alter the washed sludge composition, thus interrupting feed to DWPF while the waste is re-qualified. When Tank 40 begins processing sludge for Sludge Batch 2 in FY00, its volume will be removed from the Useable Tank Space calculation.

The "Useable Tank Space" column in Appendix H.3, I.3, and J.3 is the tank space available to support routine Tank Farm activities, such as inter-tank transfers and evaporator operations, and to store waste received by the Tank Farms. At the time of this Plan, the F- and H-Tank Farms have a combined 1,769,318 gallons of Useable Tank Space as is illustrated in Table 8-A.

Table 8-A Useable Tank Space

	No of Tanks	Volume (millions of gallons)		Comments
	51			Total number of tanks
Less	2			Tanks 17 & 20 Closed (filled with grout)
Equals	49	55.20		Total Maximum Capacity (TSR/OSR Limit)
	49	47.25		Total Working Capacity (Tank Operating Limit)
			16.21	*Total Stored Supernate*
			15.36	*Total Stored Salt*
			2.89	*Total Stored Sludge*
Less		34.45		Total Stored Waste
Equals		12.80		Total Working **Freeboard**
Less	24	5.42		Freeboard in Types I, II, and IV tanks (unavailable for reuse)
Less	4	3.00		Freeboard in Processing Tanks (Tanks 48, 49, 50, & 51 - unavailable for reuse)
Less		2.60		**Emergency Space** (reserved in the event of a tank leak)
Equals	21	1.77		Total **Useable Space**
			0.20	*F Tank Farm Minimum Evaporator Requirement (2F)*
			0.40	*H Tank Farm Minimum Evaporator Requirement (2H & 3H)*
			0.10	*F Tank Farm Minimum Waste Receipt Requirement*
			0.10	*H Tank Farm Minimum Waste Receipt Requirement*
Less		0.80		**Working Space**
Equals	21	0.97		**Available Space** (Useable Space less Working Space)

NOTE: See Appendix B for further tank space terminology definitions.

Sufficient space must be available in the Tank Farms to meet minimum SAR requirements and continue to support planned waste transfers from the Canyons and DWPF. To maintain sufficient space, Tank Farms have begun evaporating approximately 5,000,000 gallons of backlogged, dilute supernate from Type III tanks. This is expected to recover approximately 2,000,000 gal of space over the period FY99-FY01. It must be noted that the Emergency Space, and Useable Space (Working Space and Available Space) are not in one or two convenient tanks, however, the space is dispersed in tanks across the Tank Farms. A graphic representation of the tanks space in the various tanks is shown in Appendix G. (High Level Waste Tank Usage)

Influents – F-Canyon Low Heat Waste (LHW) and High Heat Waste (HHW): Reprocessing of Taiwan Research Reactor (TRR) is scheduled for completion in June 1999. Approximately 16,000 gallons of High Heat Waste and 57,000 gallons of Low Heat Waste will be generated from TRR processing. Generation of ~3,000 gallons from FB-Line operations and ~7,500 gallons from outside facilities (including General Purpose evaporator waste and Lab waste) of Low Heat Waste is expected per month based on historical data. SRS Plutonium Scrap Processing began in September 1997. Initial second Pu cycle operation in March, 1999 will generate ~37,000 gallons of Low Heat Waste. After the initial run, ~17,000 gallons of Low Heat Waste will be produced every other month when second Pu cycle operates. The Record of Decision for Rocky Flats Plutonium Scrap has not yet been finalized, but if that material is brought to SRS, reprocessing could occur in FY99 and FY00. A Process Vessel Vent (PVV) flush, to be performed in April 1999, will transfer an additional ~35,000 gallons of low heat waste in April 1999. For planning purposes, F-Canyon de-inventory flushes are assumed to occur from July-November 2002, generating ~20,000 gallons of low heat waste per month and ~2,000 gallons of high heat waste per month. Starting in September 2003, shutdown flows of ~10,000 gallons per month of low heat waste and zero high heat waste are forecast.

Influents – H-Canyon Low Heat Waste (LHW) and High Heat Waste (HHW): Processing of Mark 16 and Mark 22 charges is scheduled to continue through June 2002. This will generate ~24,000 gallons of low heat waste per month through Oct. 1, 1999. At the end of November 1999, the Canyon will increase the number of dissolver charges processed monthly. This will cause waste generation rates to increase to 36,000 gallons/month. A Warm Canyon PVV filter flush is scheduled for October/November 1999. It will generate ~20,000 gallons of relatively dilute waste to be transferred to the Tank Farm in November 1999. Anion exchange recovery of Neptunium in HB-Line is being planned, but is not currently scheduled. Transfer of Pu-238 flush will begin in May/June 1999. Dilution necessitated due to Pu-238 will create a total of ~17,000 gallons of low heat waste. Transfer of low assay plutonium will begin in October 1999. Dilution necessitated due to Pu-238 will create a total of at least 35,000 gallons of low heat waste and potentially much more. Beginning in September 2002, the only forecast activity is HB Line Plutonium scrap processing, which will generate ~3,000 gallons of low heat waste per month, and zero high heat waste.

Influents – DWPF Recycle: DWPF recycle volume will vary over the life of the facility. The volume of recycle generated reflects sludge-only canisters versus combined sludge and precipitate canisters, planned canister production rates, and the age of the facility. (As the facility ages, maintenance needs for contaminated equipment will increase, thereby increasing the amount of spent decontamination water generated.) Over the life of the program, the recycle volume will range from 2,000,000 gallons per year to 2,500,000 gallons per year, based on a 200 canister per year production rate. The recycle algorithm has been updated to reflect recent facility operating experience, and is explained in Section 8.6.

Influents – Tank Wash Water: The waste tank interiors of all tanks 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 assumes two 25,000-gallon washes, which is a level of about 24 inches in the annulus for each wash. This Plan assumes that all tanks are water washed.

Influents – ESP: The ESP wash water volumes are based on CPES modeling for each of the remaining sludge batches. The wash water for each batch is generated during the ~12 - 30 month period immediately before the batch is fed to the DWPF. The wash water duration will vary from batch to batch depending on waste composition. No distinction is made between sludge wash water, aluminum dissolution waste, and the water used to slurry and transport the sludge to the ESP tanks. It is currently assumed that all of the ESP washwater will be evaporated. However, some washwater may be used in sludge removal or to dissolve salt. For more details on ESP, refer to Section 8.5.1.

Other Influents: Miscellaneous influents are received into the Tank Farms from RBOF (~155,000 gallons/year), the 299-H repair facility (~12,000 gallons/year), rainwater from sumps (~85,000 gallons/year), and internal additions such as flushes and transfer jet dilution (~200,000 gallons/year). The volumes are based on historical information. For the purposes of this plan, it is assumed that 100% of this volume is recovered via evaporation.

Effluents – Evaporators: The 2F, 2H, and 3H (RHLWE) reduce the volume of dilute, influent waste streams. In order to maintain available space in the Tank Farms during the extended Salt Processing evaluation outage, the evaporators have also begun to evaporate dilute supernate (backlog) from Type III tanks. This is expected to recover from 2,000,000 to 2,500,000 gallons of actual space over the period FY99-FY01. Reference to "evaporator space gain" for new Tank Farm influents is a misnomer, because evaporator operations can only minimize the effect of waste additions as saltcake, concentrated supernate (caustic liquor), and sludge accumulate. The only true source of Tank Farm space gain is to operate a Salt Processing facility, thereby processing the salt and supernate into an acceptable solid waste form (glass or grout). For more details on evaporator operations, refer to the "Evaporator Salt Inventory" section below, and Sections 8.2.2 and 8.3.2.

Effluents – Salt Processing: Space gain occurs when concentrated supernate, unconcentrated supernate, or dissolved saltcake is fed to a Salt Processing facility. This Plan credits recovered space immediately when it is fed to the Salt Processing facility. The recovered space could be made available to store concentrated supernate from an active evaporator drop tank or any liquid waste, in the unlikely event of a tank leak. Although the salt processing technology has not been selected, for planning purposes, this Plan assumes that space gain is achieved using Small Tank Precipitation. For more details on Salt Processing, refer to Section 8.5.2.

8.1.2 Evaporator Salt Inventory

The evaporators reduce the volume of the various waste streams that have been received in the Tank Farms. This is crucial to the success of HLW and Site Missions. The evaporators must keep current with waste generated by Canyon operations, DWPF recycle, ESP spent wash water, and HLW tank wash water.

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. Space gain is predicted based on evaporation of each waste stream, given its chemical constituents. This is further described in Sections 8.2.2 and 8.3.2.

Video inspections and material balances made during March 1999 of the 2H evaporator system indicated that the salt volume in Tank 38 was ~903,000 gallons, which is approaching the maximum salt capacity of the tank. The 2H Evaporator's only other salt receipt tank is Tank 41, which is already filled. Plans to dissolve the Tank 41 salt were suspended pending resumption of salt processing. Therefore, to extend the useful life of Tank 38, the operation of the 2H Evaporator has been changed to produce a concentrate stream with a specific gravity of 1.30-1.45, vs. a previous level of about 1.50. Approximately 90% of the waste volume reduction can still be achieved at the lower specific gravity, by concentrating the waste to a sodium molarity just below the point at which saltcake is formed. This effort to extend the use of Tank 38 has been successful as verified by camera inspections performed over the last 3 years. These inspections have shown very little salt formation growth during this period. The concentrated supernate will be periodically transferred to tanks in the Tank Farm external to the evaporator system to enable the evaporator to continue operating. The most recent such decant occurred in March 1998, when ~329,000 gallons of concentrated supernate were transferred to Tank 40.

With the delay in Salt Processing, operation of all the evaporator systems must be optimized. Where it is best for the HLW System, the generation of salt in the evaporator receipt tanks should be minimized. Waste should be concentrated as far as is achievable (*i.e.*, as close to the theoretical space gain factor) and then be transferred out of the evaporator system to another storage tank. Space in storage tanks will be made available through the evaporation of existing backlogged supernate (Tanks 35, 39, and 42 via 40) or by the reuse of an additional tank not currently available (Tanks 49, 50, or 4-8).

A HLW Space Management (SM) Team has been chartered to recommend the best management practices for safe stewardship of high level waste while maximizing available tank space. The assumptions used to forecast evaporator operations will be evaluated and a recommended change, if required, will be documented. The SM team is expected to issue a final report in the fourth quarter of FY99. The results of this report will be incorporated into the next revision of the Plan.

8.2 H-Tank Farm

The H-Tank Farm receives, stores, evaporates, and transfers high level waste.

8.2.1 H-Tank Farm Useable Space

The H-Tank Farm includes twelve old-style waste storage tanks, eleven new-style tanks, and three evaporator systems. At the time of this Plan, H-Tank Farm has ~1,500,000 gallons of Useable space (or Working Inventory) available.

8.2.2 H-Tank Farm Evaporators

The **1H Evaporator** vessel has a failed tube bundle. There are no plans to restart this evaporator. Therefore, the condition in the Tank Farm Wastewater Operating Permit to remove the 1H Evaporator from active service by 1/1/98 has been met.

The 1H system was chemically decontaminated in FY96. The evaporator cell, the interior of the evaporator vessel, the Concentrate Transfer System (CTS) cell, the CTS tank interior and the CTS loop line were cleaned using alternate caustic/acid flushes. This is similar to the method used for the 2H Evaporator vessel replacement. The 1H system is currently in lay-up mode.

The **2H Evaporator** system includes one feed tank (Tank 43) and two salt receipt tanks (Tanks 38 and 41). Tank 38 is the active tank; Tank 41 is full of salt. The primary role of the 2H Evaporator in FY99 is to evaporate the 221-H Canyon LHW stream and the DWPF recycle stream, both of which are normally received in Tank 43 and evaporated. After the 3H Evaporator (RHLWE) starts up, the DWPF recycle volume may be divided between 3H and 2H.

At the time of this Plan, H-Tank Farm had received ~121,000 gallons of low heat waste from H-Canyon, and ~640,000 gallons recycle from DWPF (fiscal year to date, FYTD). The 2H Evaporator has achieved ~886,000 gallons space gain, which is ~90,000 gallons over and above the target space gain of ~794,000 gallons for this date (FYTD). The 2H-evaporator utility has averaged over 90%, with a high of 97% in January 1999.

The current forecast for the remainder of FY99 calls for an additional ~276,000 gallons of H-LHW, and ~1,600,000 gallons of DWPF recycle. The 2H Evaporator is expected to achieve its FY99 space gain goal of 2,400,000 gallons.

The volume and salt content of H-LHW and DWPF drive space gain for the 2H evaporator recycle streams. The specific gravity at which the evaporator is operated is also a factor. The Appendices H.3, I.3, and J.3 (Tank Farm Material Balance) use an algorithm to forecast space gain. Based on historical and laboratory test data, the volume reduction for H-LHW is typically 71%. Space gain factors for all streams are based on historical and laboratory test data where available, process models, and projections of waste stream composition. However, since the evaporator is currently operating at a lower specific gravity, this Plan assumes that the volume reduction for DWPF recycle is 90%. As stated in Section 8.1.1, it is assumed that 100% of the Other Influent streams are recovered by evaporation. The majority of these miscellaneous streams initiate in H-Area, therefore this Plan assumes 70% is processed in the 2H evaporator and 30% is processed in the 2F evaporator. Specific quantities of existing backlogged supernate in the evaporator system (Tanks 38 & 43) at the time of this Plan will also be evaporated over the remainder of FY99 at a space gain factor unique to the source tanks. For now, the 2H space gain algorithm is:

2H Space Gain =
(H-LHW)*(0.71) +
(DWPF Recycle)*(0.9) +
(0.70)*(Other Influents)*(1.0) +
(2H Evaporator System Backlogged Supernate in gallons)*(space gain factor for that tank)

During the first 12 months of 3H Evaporator operations, a significant quantity of backlogged supernate must be evaporated in addition to its normal load. In order to balance space gain expectations between the 3H and 2H evaporators, the DWPF recycle stream may be divided 25% to 3H and 75% to 2H. During this period, the 2H Evaporator space gain algorithm will be:

2H Space Gain =
(H-LHW)*(0.71) +
(0.75)*(DWPF Recycle)*(0.9) +
(0.70)*(Other Influents)*(1.0)

Once 3H Evaporator has completed its processing of backlogged wastes, the DWPF recycle stream may be redistributed 50% to 3H and 50% to 2H. During this period, the 2H Evaporator space gain algorithm will be:

2H Space Gain =
(H-LHW)*(0.71) +
(0.50)*(DWPF Recycle)*(0.9) +
(0.70)*(Other Influents)*(1.0)

Appendix H.3 indicates that the 2H Evaporator is planned to gain 1,200,000 to 2,000,000 gallons per year. The ability to do this was demonstrated in FY98 when over 2,200,000 million gallons of space gain was recorded. The FY99 space gain pro-rated numbers also supports this figure. In FY98, the 2H system experienced a high utility rate for the entire year; however, in FY97 the 2H Evaporator system encountered two long, unplanned outages.

The two outages described below are representative of unplanned events which impact HLW's ability to meet space gain goals. HLW works diligently to minimize unplanned outages, however, on May 7, 1997, the 2H Evaporator was shut down in response to a Potential Inadequacy in Safety Analysis (PISA) regarding the source term in the evaporator vessel. Sample analyses of Tank 38 indicated a higher-than-expected quantity of sludge solids, which could only have come from Tank 43 and through the evaporator. Given this condition, the projected source term in the evaporator was calculated to exceed the SAR limit for offsite dose in the unlikely event of an evaporator explosion. During the subsequent outage, two major modifications took place. The Tank 43 feed pump eductor was raised well above the known height of sludge in Tank 43, to prevent further entrainment of sludge solids in evaporator feed. In addition, a safety class steam cut-off valve was installed to automatically stop steam feed to the tube bundle. The 2H Evaporator resumed operations on July 4, 1997, and ran well for 15 days.

On July 19, 1997, the 2H Evaporator was shut down because the gravity drain line (GDL) was plugged. Standard flushing techniques failed to clear the line. Remote video inspection of the GDL indicated that the plugged material was not crystallized salt. The material was sampled and analyzed at SRTC. The analysis showed that the deposit was high in silica and alumina content. Similar materials have been encountered in evaporator bottoms when feeds from tanks that received solid materials containing high silica content were evaporated. For example, Tanks 19F and 24H received zeolites from CRC operations and silica gel from early canyon operations. The higher silica content of this more recent feed is attributed to frit carryover from DWPF when waste from DWPF startup tests were transferred to the Tank Farm. Incorrect positioning of the feed line near the sludge layer in Tank 43 may also have contributed to higher than normal silica content in the feed to the 2H evaporator. When the frit solids, aluminate and caustic in the feed were combined and concentrated in the evaporator, conditions were likely set up to form the insoluble aluminosilicate found in the line. When the concentrate was sent to the cooler GDL, solids began to crystallize on the interior of the line. Evaporator operation under these conditions continued to deposit the solids until they finally plugged the line. A vendor with a 10,000-psi pressure wash system had to be brought in to clear the line. The 2H Evaporator resumed operations on September 2, 1997, and narrowly achieved its FY97 space gain goal of 1,600,000 gallons. These two unplanned, extended outages demonstrated the evaporator's critical role in maintaining a balance between Tank Farm influents and effluents. During the outages, DWPF recycle rapidly collected in Tank 43. When the 2H evaporator resumed operations on September 2, 1997 the HLWD had come within 7 days of implementing one of several contingency plans. These included reducing the operating capacity of the evaporator system; diverting additional recycle to Tank 40; or restricting recycle influent to the Tank Farms, and thereby curtailing DWPF operations. In light of this, an alternative path for DWPF recycle was established to Tank 22. Although every effort is made to coordinate planned outages between the Tank Farms and DWPF, unplanned outages do occur. At the time of this Plan, the Tank 22 inventory includes ~958,000 gallons of unevaporated DWPF recycle. The collected DWPF recycle may potentially be useful as Tank 40 sludge wash water, which will be needed in FY00. The 2H system has not experienced any significant unplanned outages during FY98 or FY99.

To provide even greater flexibility for the H-Area Tank Farm, two key Diversion boxes (HDB-5 and -8) have been reconfigured to accommodate DWPF transfers directly into Tank 38 or Tank 22. This level of flexibility will provide HTF with alternate storage space to keep DWPF recycle flowing and melter operation in progress. There are several planned re-configuration events at HDB-2 and -7 that will occur during the next 18 months that will also enhance the HTF's ability to move waste while providing for maximum operating flexibility.

The 2H Evaporator vessel was replaced in December 1995, and the feed pump was replaced in January 1997. The new vessel has a Hastelloy tube bundle and warming coil that is expected to last for 30 years. Therefore, downtime for pot replacement is not forecast. 2H Evaporator operation is based on a planned utility of 60% with a space gain as shown in Appendix H.3. Utility averaged 83% in FY98. The 2H evaporator is expected to operate continuously until FY25.

The **3H Evaporator** (often referred to as the Replacement High Level Waste Evaporator or RHLWE) achieved its ready for integrated testing milestone in August 1998, one month ahead of schedule. Integrated testing is in progress, however, problems with equipment and performance to design specifications has delayed initiation of the project's Operational Readiness Review (ORR) to September 1999 from June 1999. Upon completion of the ORR, the simulant test facility will be removed permitting the final spool piece tie-ins of the gravity drain lines and feed lines thereby permitting initiation of hot runs testing. Project Complete is expected by the end of October 1999.

The 3H Evaporator is planned to operate at 80% utility and at a space gain based on the forecasted availability of feed. The space gain values shown in Appendix H.3 are well within the expected capacity of the 3H Evaporator. The design basis is 7,600,000 gallons per year of overheads assuming feed at 33 gpm at 25-35% dissolved solids.

The 3H Evaporator's role will be to evaporate:

- A portion of the ESP wash water
- A portion of the tank wash water generated in H-Area
- All of the H-Area High Heat Waste Stream

- A portion of the DWPF recycle stream
- A significant quantity of backlogged supernate

The 3H Evaporator space gain algorithm is derived as follows. H-Area has about 64% of all sludge; thus, 64% of the sludge wash water is allocated to the 3H Evaporator. The space gain factor for the ESP wash water is estimated at 85%. H-Area has 29 of the 51 tanks; thus, 56% of the tank wash water is allocated to the 3H Evaporator. The space gain factor for tank wash water is estimated at 95%. All fresh Canyon wastes can be evaporated with a space gain factor of 71%. Each backlog tank has its own space gain factor, so a space gain factor is not shown explicitly in the equation below for the evaporation of backlog waste by 3H Evaporator. The space gain factor for DWPF recycle evaporated through the 3H Evaporator is expected to be 90%. In order to balance space gain expectations between the 3H Evaporator and the 2H Evaporator in the 3H evaporator's first year of operation, the DWPF recycle stream will be divided 25% to 3H and 75% to 2H. During this period, the 3H Evaporator space gain algorithm will be:

3H Space Gain = (0.64)*(ESP wash water)*(0.85) +
(0.56)*(tank wash water)*(0.95)+
(1.00)*(H-High Heat Waste)*(0.71)+
(0.25)*(DWPF recycle)*(0.90) +
(Backlogged supernate in gallons)*(space gain factor for that tank)

After the first 12 months, planned evaporation of backlogged supernate will be nearing completion. At that time, the 3H Evaporator will begin evaporating 50% of DWPF recycle, and the algorithm used to forecast 3H Evaporator space gain in gallons per year will be:

3H Space Gain = (0.64)*(ESP wash water)*(0.85) +
(0.56)*(tank wash water)*(0.95)+
(1.00)*(H-High Heat Waste)*(0.71)+
(0.50)*(DWPF recycle)*(0.90) +
(Backlogged supernate in gallons (until depleted))*(space gain factor for that tank)

Backlog supernate feed to the 3H Evaporator in FY00 includes ~1,000,000 gallons of dilute waste already present in Tank 30, the initial drop tank for the 3H Evaporator and 900,000 gallons from Tank 39. In FY01, backlog feeds will include an additional ~1,000,000 from Tank 42 (presently stored in Tank 40).

8.2.3 H-Tank Farm Waste Removal Operations

Salt Removal

With the delay in Salt Processing, maintaining sludge feed to DWPF will be the focus for the next several years.

Sludge Removal

Sludge from **Tank 11** will be processed as part of Sludge Batch 3. Work on Tank 11 is already underway. The current schedule is as follows:

- In FY99, as-built drawings will be developed, a waste removal design contract will be awarded, most of the waste removal design work will be completed, and construction D&R activities will be initiated.
- In FY00, the design will be completed and construction will continue.
- In FY01, construction will continue.
- In FY02, construction and testing will be completed, the tank turned over to Operations, and the sludge removed to Tank 51 for aluminum dissolution and sludge washing.

This schedule provides just-in-time support for planned DWPF production and easily supports the FFA closure date of 9/10. Low funding levels in FY00 moved much of the construction scope into FY01 and leaves minimal schedule contingency time for recovery from unexpected delays as were experienced on Tank 8 (tank riser interferences, high radiation rates, waste characterization issues, etc.).

Sludge from **Tank 15** will be processed as part of Sludge Batch 4.

- In FY01, walk-downs of actual tank conditions will be completed; a design TOPR will be developed and a design contract will be awarded.
- In FY02, design will be completed, construction bids will be received, a construction contract will be awarded, and construction will be started.
- In FY03, construction will continue.
- In FY04, construction and startup testing will be completed, the tank will be turned over to Operations, and waste removal will be started to Tank 40 for aluminum dissolution and sludge washing.
- In FY05, waste removal will be completed.

This schedule provides just-in-time support for planned DWPF production and easily supports the FFA closure date of 3/13. Significant issues exist on Tank 15 including:

- Dealing with existing slurry pumps and transfer pumps which must be removed and disposed of
- High radiation rates
- The fact that it is a dry sludge tank
- Evaluation of recent tank crack propagation impacts on waste removal strategies.

8.3 F-Tank Farm

The F-Tank Farm receives, stores, evaporates, and transfers high level waste.

8.3.1 F-Tank Farm Useable Space

The F-Tank Farm includes twelve old-style waste storage tanks, two of which are now closed; ten new-style tanks; and two evaporator systems. At the time of this Plan, F-Tank Farm has ~300,000 gallons of useable space available.

8.3.2 F-Tank Farm Evaporators

The **1F Evaporator** was shut down in 1988 because of high maintenance and lack of feed. There are no plans to restart this evaporator system. Some contaminated rainwater was pumped out of the 1F evaporator cell in February 1998 and steam to the 1F system was permanently isolated in May 1998. However, at the time of this Plan, no chemical cleaning has been done and no decontamination and decommissioning activities have occurred.

In 1998 the **2F evaporator** system achieved a space gain total of ~ 706,000 gallons. During the year, the 2F system experienced several planned and unplanned outages that varied from utility infrastructure problems to TSR implementation of key components. In addition, during FY98, two Inter Area Line (IAL) transfers (~530,000 gallons) were made to the 2F system to begin to evaporate HHW backlog from HTF. For FY99 YTD the 2F system has achieved ~136,000 gallons of space gain which is ~ 100,000 below its pro-rated goal of 240,000 gallons. FTF has received ~ 91,000 gallons of waste from 221-F with ~ 200,000 gallons more forecast to be transferred. Two additional IAL transfers from HTF have been made in FY99 totaling 456,000 gallons. On November 28, 1998, the 2F system was unexpectedly shut down because of high tritium concentrations in its overheads stream that is sent to ETF. The evaporator remained down for approximately six weeks while an interim solution was reached between HLW, ETF and ESH&QA (see Section 7.9). As of this writing the 2F evaporator is on line but it is doubtful that it will have enough running time and inventory to achieve its space gain goal of 800,000 gallons.

The 2F evaporator currently evaporates 100% of the F-Canyon HHW and LHW, and 100% of the H-Canyon HHW backlog until startup of the 3H evaporator. Much of the backlog unconcentrated supernate from H-Tank Farm will also be evaporated in 2F. (Note: Each backlog tank has its own space gain factor, so one is not shown explicitly in the equation below.) In addition, starting in FY99, 2F will evaporate 36% of the ESP wash water and 44% of the tank wash water when these streams are generated. (F-Area has about 36% of all sludge and 22 of the 51 tanks, thus 36% of the sludge wash water and 44% of the tank wash water is allocated to 2F). As stated in Section 8.1.1, it is assumed that 100% of the Other Influent streams are recovered by evaporation. The majority of these miscellaneous streams originate in H-Area, therefore this Plan assumes 70% is processed in the 2H evaporator and 30% is processed in the 2F evaporator. Specific quantities of existing backlogged supernate in the evaporator system (Tanks 26 & 46) at the time of this Plan will also be evaporated over the remainder of FY99. Therefore, the algorithm used to forecast space gain for the 2F Evaporator is:

2F Space Gain = (1.00)*(F-LHW)*(0.71) +

(1.00)*(F-HHW)*(0.71) +
(0.36)*(ESP wash water)*(0.85) +
(0.44)*(tank wash water)*(0.90) +
(0.30)*(Other influents)*(1.0) +
(Backlog supernate in gallons)*(space gain factor for that tank)

Evaporation of 650,000 gallons backlog supernate from Tanks 26, 32, and 33 are planned for FY99. Forecast backlog feed to 2F in FY00 includes ~300,000 gallons of supernate from Tank 35.

HLWD experience operating HLW evaporators indicates that the average life expectancy of evaporator vessels is 10.5 years. The 2F Evaporator vessel will reach 10.5 years of service in April 2000. The plan is to operate the 2F evaporator until failure, so a replacement outage is not specifically scheduled at this time. A new vessel is currently on order with an expected procurement completion date of March 2000. The evaporator storage or disposal box is in the design phase.

8.3.3 F/H Interarea Transfer Line

The capability to transfer between F-Tank Farm and H-Tank Farm was restored in FY97. Several successful transfers have been made since then. Planned evaporation of H-Tank Farm backlogged HHW in the 2F System, and subsequent de-inventorying of the concentrated supernate from 2F into H-Tank Farm, will require numerous uses of the Interarea Transfer Line during the period FY99-FY01. Tank 8 sludge will also be transferred to Tank 40 via the Interarea Line in FY00.

8.3.4 F-Tank Farm Waste Removal Operations

Salt Removal

With the delay in Salt Processing, all efforts for the next several years will be focused on maintaining sludge feed to DWPF.

Sludge Removal

Tank 8 was a dry sludge tank. A Potential Inadequacy in Safety Analysis (PISA) related to dry sludge tanks was resolved for Tank 8 when 44,000 gallons of inhibited water was added in October 1998. The current sludge level is 49" and the tank level is 64". The tank liquid level and temperatures have remained constant since October 1998. Modifications to Tank 8 are currently in the final stage of design with heavy construction in progress. Tank 8 turn over to operations is currently scheduled for September 1999. There has been an extraordinary amount of emergent work related to the poor condition of the tank infrastructure systems, tank-top equipment, and supporting services. There have been significant Lessons Learned obtained from Tank 8 preparation work that will be factored into future waste removal tanks where possible. In FY00, the sludge will be removed to Tank 40 for washing as part of Sludge Batch 2. This schedule provides just-in-time support for planned DWPF production.

The **Tank 19** heel removal technology has been determined via small and full scale testing. Three oscillating 50-hp Flygt mixers will be used to simultaneously suspend the sludge solids in the entire tank. Testing at Pacific Northwest National Laboratories (PNNL) indicated that a velocity greater than 1.6 ft/sec was required to suspend zeolite solids and greater than 1.0 ft/sec was required to suspend sludge solids. Full-scale tests at TNX indicate that three 50-hp Flygt mixers can achieve these velocities throughout Tank 19. The equipment is currently being designed and fabricated. Installation and demonstration was scheduled for FY99, however, this scope was deferred to FY00 due to the manpower freeze in FY99. This schedule provides just-in-time support for tank closure by the FFA date of 3/03. Refer to Section 8.4.3 for details on Tank 19 closure plans.

The **Tank 18** heel removal technology baseline is to replace the three failed slurry pumps with three new slurry pumps with different discharge configurations. Start of design and construction was deferred to FY01 due to the projected funding shortfall in FY00. This schedule will provide just-in-time support for tank closure by the FFA date of 3/04. Refer to Section 8.4.3 for details on Tank 18 closure plans.

Tank 7 Title II design continues in FY99. Riser 4 was successfully probed to confirm that there are no obstructions preventing transfer pump installation.

- In FY00, design will be completed, construction will be started, and the transfer pump will be installed.
- In FY01, construction will continue.
- In FY02, construction and startup testing will be complete.
- In FY03, approximately 70% of the sludge will be removed to Tank 51 for sludge washing as part of Sludge Batch #3. The remaining 30% will be part of the next sludge batch.

This schedule just barely supports planned DWPF production and easily supports the FFA closure date of 9/22.

Sludge from **Tank 4** will be processed as part of Sludge Batch 4.

- In FY02, walk-downs will be completed, a design TOPR will be developed, a design contract will be awarded, and design will be started.
- In FY03, design will be completed, construction bids will be received, a construction contract will be awarded, and construction will be started.
- In FY04, construction will continue.
- In FY05, construction and startup testing will be completed, the tank will be turned over to Operations, and waste removal will be completed to Tank 40 for sludge washing. Waste removal will be completed in late FY05.

This schedule provides just-in-time support for planned DWPF production and easily supports the FFA closure date of 9/22.

8.4 Waste Removal

Waste Removal Cost Baseline

Waste Removal recently completed a project rebaselining to develop a new estimate for the cost of retrofitting salt and sludge tanks with waste removal equipment. This significant effort provides up-to-date project cost information to use in the HLW Financial Model to determine annual funding requirements and Life Cycle Costs.

Waste Removal from Type I, II and IV Tanks

Four different designs, or "Types," of carbon steel waste tanks are used to store liquid HLW at SRS, but only the Type III Tanks meet current requirements for leak detection and double containment as defined in the FFA. The Type I and Type II Tanks have inadequate secondary containment and leak detection capabilities, and the Type IV Tanks have no secondary containment at all. Although eleven of the non-compliant HLW tanks have leaked in the past, the HLWD's formal tank integrity monitoring program indicates that none of the known leak sites is currently active. Still, risk to the environment will be greatly reduced by removing the waste from these tanks and immobilizing the waste in a solid borosilicate glass or stabilizing it in a saltstone waste form.

Per this Plan, some of these tanks will be over 50 years old before they are closed. In the last 2 years, two additional tank integrity issues have arisen with these tanks:

- Tank 15 has developed a type of leak site not previously seen: a crack running parallel to a weld seam, above the waste level, approximately 18 inches in length.
- This type of leak site will make waste removal from this tank much more difficult. If other tanks develop similar leak sites, the risk of releases and the complexity and cost of future waste removal will be increased.
- Increased corrosion is being seen in several tank secondary pans. These secondary pans, which represent the last lines of defense for this waste, already contain waste from previous leaks in the primary walls of the tanks.

Although SRS maintains an aggressive program to monitor the integrity of all waste tanks, these recent findings underscore the need to complete infrastructure upgrades and waste removal from these tanks as soon as possible.

Waste Removal Sequencing Considerations

The Sludge and Salt Removal sequencing in this Plan is essentially the same as in HLW System Plan, Rev. 9. Several changes were required, primarily to compensate for maintaining the sludge schedule at 200 cans/yr while the salt processing schedule moved out to a startup of FY10 versus FY02 in Rev. 9. Additional sludge tank sequencing changes are discussed in Section 8.5.1.

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

1. Maintain emergency tank space per the Technical Safety Requirements (TSR)
2. Control tank chemistry, including radionuclide and fissile material inventory
3. Enable continued operation of the evaporators
4. Ensure blending of processed waste to meet salt processing, DWPF, and Saltstone feed criteria
5. Remove waste from tanks with a leakage history
6. Remove waste from tanks that do not meet FFA requirements
7. Provide continuous radioactive waste feed to DWPF
8. Maintain an acceptable precipitate balance within the salt processing facility
9. Remove waste from the remaining tanks

The principal goal of the regulatory drivers is to remove waste from the old-style tanks. In the Planning Case, waste will be removed from all of the old-style tanks by 2017. However, once Salt Processing is operational salt waste must concurrently be removed from some of the Type III Tanks to support the cleanup of the older tanks. Concentrated supernate and/or salt removal from new tanks are required to maintain the evaporator systems on-line and to provide receipt space for large transfers of ESP washwater and DWPF recycle. Removal of concentrated supernate or salt from Type III Tanks 41, 29, 25, 47, and 38, must receive priority over some of the non-compliant salt tanks to enable continued operation of the 2F, 2H and 3H Evaporator systems.

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. In addition to providing safe storage of waste, additional tank space must be generated to serve as surge capacity. In past revisions of the Plan, the recovered tank space resulted almost entirely from the operation of the salt processing facility. However, with the delay in salt processing, additional tank space must obtained through the efficient evaporation of existing backlog supernate and through the planned reuse of Type III Tanks 49 and 50 and Type I Tanks 6 through 8. Processing dilute HLW supernate through the evaporator systems reduces the amount of space required to store waste, but does not constitute "recovered space," per se. This space gain is extremely important for the following reasons:

- To support critical site production and cleanup missions by providing tank space to receive new waste
- To maintain the evaporator systems on-line
- To provide space to receive the large volume, low-level radioactivity waste transfers which are a by-product of ESP, Waste Removal and DWPF operations
- To ensure flexibility to handle unanticipated problems (such as a leaking tank, or sudden increase in Canyon effluents) that could require additional tank space

The "Useable Tank Space" column in Appendix H.3 is the working inventory of tank space available to support these Tank Farm activities. At the time of this Plan, the F- and H-Tank Farms have a combined 1,769,000 gallons of working space available (in addition to the 2,600,000 gallons that are always reserved for emergency spare space). A significant portion of this Plan is dedicated to planning tank space availability.

With the startup of Salt Processing being planned for FY10, a HLW Space Management (SM) Team has been chartered to recommend the best management practices for safe stewardship of high level waste while maximizing available tank space. The SM team is expected to issue a final report in the fourth quarter of FY99. The results of this report will be incorporated into the next revision of the Plan.

Salt Removal Technical Baseline

The salt removal technical baseline is based on three slurry pumps per salt tank. The slurry pumps are positioned just above the saltcake, and water is added to the tank. When the slurry pumps are started, the boundary layer of salt solution in contact with the saltcake is displaced thus exposing the underlying saltcake to unsaturated water. When the water becomes saturated with salt, it is transferred to the salt processing facility. Then the slurry pumps are lowered and the process is repeated. This technique was successfully used on Tanks 17, 19, 20, and 24. Three slurry pumps for salt removal were selected as the project baseline in the early 1980's for four reasons:

- The salt removal rate was fast enough to support a production rate of 405 canisters/year

- The agitation provided by three slurry pumps was vigorous enough to also remove insoluble solids known to be in all salt tanks
- Economy of scale could be achieved by using the same pumps for salt and sludge removal
- Slurry pumps were considered to be cost effective

Since that time, the cost has increased due to the use of enhanced mechanical seals and slurry pump containment.

8.4.1 Salt Removal Demonstrations

Salt removal demonstrations in actual waste tanks have been postponed due to the delay in salt processing. See Section 9.2 under Technology Development for current work being done on alternative waste removal methods. Three less expensive alternative salt removal techniques were previously proposed, including Modified Density Gradient, a Single Slurry Pump, and a Water Jet.

8.4.2 Sludge Removal Demonstrations

The technical basis for sludge removal uses four standard slurry pumps and one telescoping transfer pump. Two alternate sludge suspension technologies are being developed via the Tanks Focus Area: the Advanced Design Mixer Pump and the use of Flygt mixers. SRS will be expected to support these demonstrations. See Section 9.2 under Technical Development for current work being done on alternative waste retrieval methods.

8.4.3 Closure Program

The Savannah River Site has begun to close HLW tank systems. SRS closes HLW tank systems under the F/H Tank Farm Industrial Wastewater Operating Permit and South Carolina Regulation R.61-82, "Proper Closeout of Wastewater Treatment Facilities". In addition, SRS recognizes that future RCRA/CERCLA remediation actions may be required to clean up contaminated soils and groundwater in the Tank Farms. Therefore, the SRS Tank Closure Program is structured to be consistent with the comparative analyses performed as part of a RCRA corrective measures study, and a CERCLA feasibility study under the FFA. See additional discussion on Tank Closure under Section 5.3 Regulatory Constraints – NEPA.

The performance objectives for HLW tank system closure are the groundwater protection standards applied at the point where groundwater discharges to the surface (seepline), and the surface water quality standards applied in the receiving stream. Closure options for each tank are evaluated to show conformance with the performance objectives as part of the overall evaluation.

DOE has determined that the material remaining in the tank systems at closure satisfies NRC criteria for "incidental waste," if remaining waste:

> *(a) "has been processed (or will be further processed) to remove key radionuclides to the maximum extent that is technically and economically practical;*
>
> *(b) will be incorporated in a solid physical form at a concentration that does not exceed the applicable concentration limits for Class C low-level waste as set out in 10 CFR Part 61; and*
>
> *(c) will be managed, pursuant to the Atomic Energy Act, so that safety requirements comparable to the performance objectives set out in 10 CFR Part 61 are satisfied."*

The general protocol for SRS tank system closure is as follows:

1. Bulk waste is removed and the tank is water washed.
2. Any waste remaining in the tank after water washing is considered residual waste. The residual waste is characterized, and a method for stabilizing the residual contaminants is proposed. Based on work done to date, it is evident that some type of chemical cleaning, using oxalic acid or some other more DWPF compatible chemical, will be required to reduce waste heel to levels required. (See Section 9.2 and 9.3 for technical development work on this subject).
3. The proposed closure configuration is subjected to fate and transport modeling to evaluate compliance with overall performance objectives as determined by applicable environmental regulations. Contributions from other nearby tanks and non-tank sources are also included in the calculations.
4. The portion of the performance objectives remaining after subtracting non-tank sources is apportioned among the tanks to determine individual, tank-specific performance objectives.

5. Detailed tank-specific closure modules are prepared for each tank system and submitted to SCDHEC for approval. SCDHEC approval is a prerequisite to starting emplacement of backfill material.

Grout backfill is used to perform three functions. A "reducing" grout is poured in the tank first to stabilize the residue. This grout has chemically reducing properties, which encourage some of the radioactive isotopes to remain insoluble, and therefore less mobile. This reduces the migration of contaminated materials to the surrounding water systems. Controlled Low Strength Material (CLSM) is a specially formulated grout that fills the empty voids in the tank system thereby eliminating the chance for subsidence. Its mechanical properties are similar to compacted soil. In case institutional control is lost, an intruder barrier is provided by pouring a layer of relatively strong grout at the top of the tank or by crediting the reinforced concrete tank top. For the Type IV tanks a strong grout layer was poured to provide this added intruder protection. Different grout formulations continue to be tested to reduce cost and/or improve performance.

The Tank 17-20 cluster in F-Area was selected as the first set of tanks to be closed, for several reasons. Tanks 17-20 are old-style tanks, which will not be returned to service after waste removal. Very little waste remains in any of the four tanks (see below for more details). Tanks 19 and 20 have a history of groundwater in-leakage. In addition, these are Type IV tanks, which lack internal structures, thereby simplifying removal of sludge heels and emplacement of backfill material. Tank 16, an H-Area Type II tank which has already undergone bulk waste removal, water washing and acid cleaning, also will be closed. Tanks 20 and 17 were closed in 1997.

Tank 20 was the first HLW Tank operationally closed at SRS. Bulk waste removal and water washing were completed in 1986. Ballast water was removed in July 1996. Photographic inspections of the tank interior revealed ~1,000 gallons of residual sludge on the bottom of the tank. The waste was characterized by process knowledge and sampling. SCDHEC approved the Tank 20 Closure Module on January 30, 1997. DOE-SR has determined through their ongoing interactions with the NRC that the NRC had "no objection" to the closing of Tanks 20 and 17. WSRC began placing the reducing grout in Tank 20 on April 24, 1997, using an on-site continuous feed plant located near Tank 20. The reducing grout was placed in several stages. The first layer was placed in liquid form using multiple pour locations. Grout was alternately poured through six perimeter risers and one center riser. The dense grout lifted the waste sludge, which is less dense, off the tank bottom and spread it across the tank. The loose waste sludge was then immobilized by blowing in dry powdered grout. The dry particles hydrated, incorporating the water into the grout powder, and formed a hard mass. More liquid grout was poured from the center riser, forming a domed cap fully encapsulating the waste within the grout layers. Bleed water generation was kept to a minimum due to the special formulations of the backfill materials. 518 cubic yards of liquid grout was used along with 141,620 lbs. of dry grout material. The entire filling operation was observed using a remotely operated video camera. The grouts and CLSM were shown to be very flowable while in the liquid state and were able to self-level and fully surround and enclose tank equipment. SCDHEC approved the Tank 20 closure on July 31, 1997.

Tank 17 was the second waste tank operationally closed at SRS. Bulk waste removal of 376,000 gallons of sludge was completed in 1985. Approximately 280,000 gallons of tritiated water was transferred from Tank 17 to Tank 6 in March 1997, leaving a sludge heel of ~10,000 gallons. Flygt mixers (4 horsepower and 15 horsepower sizes) were used to suspend the sludge heel, and water brushes were used to sluice the suspended sludge toward diaphragm pumps for removal to Tank 18. Approximately 2,200 gallons of solids and 200 gallons of water remained in Tank 17 after sluicing. These waste solids were sampled; sample results confirmed that process knowledge estimates were reasonable. The reducing grout was placed in several layers. The first one-foot layer was placed in liquid form using multiple pour locations. When the grout was first introduced, some of the sludge was lifted off the tank bottom by the dense grout. Some intermixing occurred between the grout and the sludge. After the first one-foot layer, no visible sludge remained on the top of the grout. At this point, the remaining reducing grout was poured from the center riser to achieve a total of ~6 feet (1,330 cubic yards) of reducing grout. This was followed by ~28 feet (5,416 cubic yards) of CLSM, and ~11 feet (1,307 cubic yards) of 2,000 psi high strength grout. The Tank risers were filled with 28 cubic yards of 5,000-psi high strength grout. SCDHEC approved the Tank 17 closure on December 15, 1997.

Tank 16 was the subject of a rigorous waste removal, water washing, and acid washing demonstration in 1978-80. Waste removal from the primary tank is considered complete. However, large quantities of insoluble salts remain in the annulus. Some of the crystallized saltcake may have evolved into natro-devyne, a hard, insoluble compound, which would not dissolve easily. A sample tool was developed in the spring of 1998 and deployed in May 1998. Samples retrieved from the annulus were analyzed and preliminary fate and transport modeling revealed that further cleaning is required. Further work on Tank 16 is not currently funded for several years due to other resource priority. The FFA closure commitment date is FY15.

Tank 19 bulk waste removal occurred in 1986 using two slurry pumps mounted in diametrically opposing risers. This equipment configuration created a "beachline" of sludge and zeolite (spent ion exchange media), roughly 18 inches high, running across the diameter of the tank bottom. The zeolite particles are large, making them difficult to remove with only two slurry pumps. Zeolite covers some piles of sludge. Waste samples obtained with a specially designed sample tool (mud snapper) in 1995 revealed that the heel is soft and probably easily mobilized. Therefore, the current plan for Tank 19 heel removal is to use 50 horsepower Flygt mixers currently being tested for that purpose. Because of the presence of zeolite in Tank 19, SRTC has enhanced a vendor's remote crawler and is testing it for possible use in Tank 19. The residual waste and wash water from Tank 19 will be consolidated in Tank 18. The Tank 19 transition box has been built but not installed. As with Tank 16, Tanks Focus Area funding is being used to support most FY99 activities. Tank 19 closure is currently funded in FY02 and FY03. Closure in FY03 meets DOE's FFA commitment to close Tank 19 in FY03.

Tank 18 will be the last tank closed in this cluster because Tanks 17, 19 and 20 can only transfer into Tank 18, and Tank 18 is the only one of the four that can transfer out to FDB-1. The tank currently contains about 42,000 gallons of sludge and 308,000 gallons of supernate. After the Tank 19 waste is transferred into Tank 18, the combined contents of Tanks 18 and 19 will be transferred to another tank. This tank is currently designated to be Tank 7 but transfer route issues must be resolved. Tank 18 will be closed in FY04. This meets DOE's FFA commitment to close Tank 18 in FY04.

8.5 HLW Pretreatment

8.5.1 Extended Sludge Processing (ESP)

General

The ESP facility performs two main functions. First, for H-Area sludge it uses high temperature caustic dissolution to remove excess aluminum in sludge, which improves glass viscosity and reduces the total number of canisters to be produced. Second, the H-Area sludge, which has undergone Aluminum dissolution, is combined with F-Area sludge and washed. The sludge is washed with water to remove excess alkali, in order to make the sludge compatible with the vitrification process.

The current inventory of sludge in the HLW tanks will be divided into ten discreet sludge batches as shown in Appendix H.5. The ten batches were modeled using CPES and PCCS for Revision 9 of the Plan and projected to make acceptable glass. Due to the delay in Salt Processing and other factors, several changes in tanks making up Sludge Batches were made from what was assumed for Revision 9 of the Plan. A summary of the changes is as follows:

- Tanks 18 and 19 were moved from Batch 3 to Batch 4

  Reason: There is a small amount of sludge in these tanks (~50 kgal). Current resource priorities are on tanks with large amounts of sludge (Tanks 8, 11 and 7). Removal of waste from Tanks 18 and 19 will be completed on a schedule to meet FFA commitments.

- Tanks 12 and 15 switched batches. Tank 12 moved from Batch 4 to 5 and Tank 15 moved from Batch 5 to 4.

  Reason: Recently discovered crack propagation in Tank 15 drives us to want to empty this tank earlier in the schedule. Tanks 12 and 15 contain similar amounts of sludge with similar compositions.

- Tanks 26 and 47 switched batches. Tank 26 moved from Batch 7 to 6 and Tank 47 moved from Batch 6 to 7.

  Reason: Tank 47 has a significant amount of salt (~800 kgal) which must be removed before removing sludge. With the delay in Salt Processing, Tank 47 sludge will not be available for Batch 6. Tanks 26 and 47 contain similar amounts of sludge with similar compositions.

- Tank 14 has been taken out of Batch 4

  Reason: Due to the small amount of sludge (~27 kgal) as compared to salt (~156 kgal), Tank 14 has been reclassified as a salt tank.

The current sludge inventory is estimated to produce about 5,573 canisters. In addition to the canisters associated with sludge processing, there will also be an estimated 159 canisters of salt only glass made at the end of the program for an overall estimated total of 5,732 canisters produced. The 5,732-canister estimate is an increase from the 5,200 canisters estimated in the last revision of this Plan. The estimate of the total canister count was increased based on two primary reasons:

- Actual production experience with Sludge Batch 1A where can loading averaged 3,810 lbs./can at a sludge loading of 25 wt%
- Higher amount of sludge solids existed in Tank 51 than was originally estimated.

The planning basis for the ESP facility has changed. The original facility flowsheet was based on using two tanks for co-washing while a third tank fed DWPF. However, one tank (Tank 42) will soon be re-deployed as a storage tank for concentrated supernate. This precludes using a co-washing flowsheet. Therefore, the revised ESP flowsheet calls for Tanks 40 and 51 to alternate roles as processing and feed tanks. Both tanks will be retrofitted with steam spargers and caustic addition facilities to provide aluminum dissolution capability. If possible, some partial washing of sludge may be performed in-situ, *i.e.*, in the tank where the sludge currently resides. Then the partially washed sludge will be consolidated in either Tank 40 or 51 for aluminum dissolution, as required for H-Area sludge, and final washing and blending just prior to starting feed to DWPF.

Production Capacity

Sludge batch preparation, from in-situ washing and aluminum dissolution through sludge consolidation and final washing and blending is planned to require from 12 to 31 months. The feed preparation duration at ESP is typically broken down in to the following major activities:

- Receive H-Area sludge
- Allow to settle and decant water required for suspension and transfer
- Perform Aluminum dissolution
- Allow to settle and decant Aluminum dissolution water
- Receive F-Area sludge
- Allow to settle and decant water required for suspension and transfer
- Perform wash of combined F- and H-Area sludge. Repeat as necessary to reach proper waste composition.
- Sample, qualify test glass
- Ready for feed to DWPF

The total duration is dependent primarily on the number of washes that must be performed though many other factors will also apply. The size of each batch is limited to approximately 600,000 to 700,000 gallons at 19 wt % solids due to the projected mixing capacity of the quad-volute slurry pumps in Tanks 40 and 51. ESP can therefore produce approximately 600,000 – 700,000 gallons of sludge feed every two to three years for feed to DWPF.

Production Plan

Tank 51 transferred about 680,000 lbs. of sludge solids to DWPF while DWPF was processing Sludge Batch 1A. Tank 51 is currently feeding Sludge Batch 1B to DWPF. Sludge Batch 1B consists of about 140,000 gallons of sludge from the heel of Sludge Batch 1A and about 470,000 gallons of washed sludge received from Tank 42. About 492 canisters were produced from Sludge Batch 1A. About 600 canisters are projected from Sludge Batch 1B.

Tank 42 currently contains 35,000 – 50,000 gallons of settled sludge. Numerous transfers were made from Tank 42 to Tank 51 in 1998 to prepare for Sludge Batch 1B. The transfer of the remaining heel into Tank 51 would have required the addition of significant quantities of inhibited water that would have diluted Sludge Batch 1B to unacceptable levels.

It is planned to transfer the remaining Tank 42 heel into Tank 40 to become part of Sludge Batch 2. The concentrated supernate in Tank 40 will be used to remove the remaining Tank 42 heel as follows. First, a few hundred thousand gallons of supernate in Tank 40 will be transferred to Tank 42. Tank 42 will be slurried and the material will be transferred back to Tank 40. After being allowed to settle, the Tank 40 supernate will then be transferred back to Tank 42 for storage so that Tank 40 preparations for Sludge Batch 2 washing activities can be completed. Removing the Tank 42 heel at this time has the following benefits to the program:

1. It provides additional storage space in Tank 42 for concentrated supernate.

2. It allows the removal of sludge using the existing operational slurry pumps in Tank 42. This is preferable to retrofitting the pumps for heel removal in 10+ years per the original plan.
3. It extends the estimated feed duration of Sludge Batch 2 due to the addition of the Tank 42 sludge.

Sludge Batch 1B is projected to last until June 2001. By that time, Sludge Batch 2 must be ready to feed. This batch consists of the sludge currently in Tanks 8 and 40; in addition, some Tank 42 heel as discussed above. Aluminum dissolution is not required so the expected duration for washing, consolidating, sampling and making test glass has been reduced to an estimated 12 months. Washing must therefore start in August 2000 at the latest.

Tank 40 currently contains four slurry pumps from Tank 51 that require rework. To prepare Tank 40 for sludge washing service, these pumps must be removed and dispositioned. Four quad-volute slurry pumps have been run in and must be installed once the present pumps in Tank 40 are removed. Tank 40 already contains about 170,000 gallons of unwashed sludge and about 1,000,000 gallons of concentrated supernate. The supernate will be transferred to Tank 42 prior to transferring Tank 8 sludge into Tank 40.

8.5.2 Salt Processing

Of the 34 million gallons of high level waste in storage, approximately 3 million gallons are sludge waste and 31 million gallons are salt waste. The sludge waste, which is insoluble and settles to the bottom of a waste tank, generally contains insoluble radioactive elements including Strontium, Plutonium, Americium, and Curium in the form of metal hydroxides. The salt waste, which is soluble and is dissolved in the liquid rather than settling to the bottom of the waste tanks, contains most of the soluble radioactive element Cesium. The salt supernate and dissolved salt cake removed from the waste storage tanks will be processed to remove the radioactive Cesium. The Cesium contains approximately 99.99% of the radioactivity in the salt waste but is only a small fraction of the total previous volume. Since Cesium is the only part of salt waste that is high-level waste, it is the only part that must be transferred to DWPF for vitrification and ultimate storage in a Federal Repository. The remaining salt solution, now without radioactive Cesium, is classified as low-level waste. This decontaminated salt solution, although it contains less than 0.01% of the previous radioactivity, is the bulk of the previous volume. It is sent to the Saltstone Facility for safe, on-site disposal.

Systems Engineering Evaluation

Work on salt processing was suspended in January 1998, due to technical issues with the In-Tank Precipitation (ITP) Facility. Since January 1998, a rigorous systems engineering evaluation was completed on all available salt processing technologies, reducing the options from 130 to three alternatives.

- **Small Tank Tetraphenylborate Precipitation**
  The Small Tank TPB facility uses chemical precipitation/adsorption and filtration to separate Cs-137, Sr-90 and Pu from salt solution into a low-volume, high radioactivity waste stream known as "precipitate," and a high-volume, low radioactivity waste stream known as "filtrate." The precipitate is washed to reduce the nitrite concentration from 0.4 M NO_2 to 0.01 M NO_2. The lower NO_2 concentration reduces the formation of attainment limiting, high boiling organic compounds in the DWPF melter feed preparation ventilation system to safe and manageable levels. The filtrate is combined with ETF evaporator concentrate and then solidified and disposed as Saltstone grout.

- **CST Non-Elutable Ion Exchange**
  The CST Non-Elutable Ion Exchange process uses adsorption filtration to remove the Sr-90, U, and Pu from the waste using Monosodium Titanate (MST). It then removes the Cs-137 by adsorption on Crystalline Silicotitanate (CST). The decontaminated salt solution is then combined with ETF evaporator concentrate, solidified and disposed as Saltstone grout. The Adsorption media (both CST and - MST) are transferred to DWPF for incorporation into the glass.

- **Direct Disposal in Grout**
  The Direct Disposal in Grout process uses adsorption (MST) filtration to remove the Sr-90, U, and Pu from the waste. It then processes the Cs-137 with the other remaining salt solution radionuclides for disposal in a Class C Low-Level Waste grout facility.

Currently R&D is being completed on these three alternatives to provide risk evaluations to aid DOE's selection of the preferred alternative. By the end of 1999, DOE will have selected the preferred technology for the new salt processing plant and a final Record of Decision on the selected technology is scheduled for spring

2000. Per a May 1999 DOE-HQ decision, a new strategy for alternative salt processing will be developed. The impacts of this directive have not been incorporated into the development of this Revision of the Plan.

For the purpose of this Plan, the documented values (salt solution feed volumes, precipitate feed rates, etc.) from the Small Tank Tetraphenylborate Precipitate process were used for modeling of the HLW System. Once a final decision is made on the preferred salt disposition process, a new revision of the HLW System Plan will be generated.

It is critical to resolve the salt processing flow sheet as quickly as possible. The DWPF vitrification specifications allow for sludge-only canisters and for combined salt-sludge canisters. This is because certain sludge constituents are required chemically to make high quality glass. Additionally, when a combination salt-sludge batch is being processed, the treated salt waste dissolves into the molten glass, creating no additional volume. Therefore, virtually no additional canisters are made if salt is combined with sludge. However, to produce precipitate-only canisters, special chemicals or "sludge simulant" must be added to replace the sludge. This would increase costs and create more canisters.

Production Capacity

The Salt Processing facility will not operate during DWPF melter outages, which are assumed to be 6 months in duration and will be required for every 2 years of operation. Therefore, Salt Processing is assumed to operate 2 years out of every 2.5 years.

This Plan is based on the Tank Farms providing 6.5 million gallons (at 6.44 Molar sodium) salt solution feed per operating year to the Salt Processing facility. Therefore, in an average year the Tank Farms will provide 5.2 million gallons (6.5 million x 2/2.5) of salt solution feed. Note: Salt solution fed to Salt Processing at 6.44 Molar sodium will be diluted to 4.7 Molar sodium in the Salt Processing facility.

In an average year, the process will feed 325 kgal of precipitate to DWPF. The precipitate feed value is limited by DWPF salt cell processing capabilities and assumes the ability to blend in the precipitate with sludge and frit to produce acceptable glass. It is also assumed that the precipitate feed can be blended in with the planned sludge feed on a no impact basis. That is, no additional cans will result from blending in the precipitate feed with the sludge feed. Current studies are underway to validate the assumption that salt loading in the range of 10-12 wt% of PHA oxides (which corresponds to the 325 kgal of precipitate feed volume) for coupled glass is acceptable. These precipitate loading ranges are being tested as part of the current limited scope for final selection of the Salt Processing alternative.

8.6 Defense Waste Processing Facility (DWPF)

DWPF is currently in "sludge-only" Radioactive Operations. At the time of this Plan, DWPF has poured 554 canisters (64 in FY96, 169 in FY97, and 250 in FY98 and 72 in FY99 through January 22.). This represents completion of approximately 10% of the total number of canisters to be produced over the life of the facility.

Production Capacity

DWPF operation was initiated in FY96. In FY96, FY97, and the majority of FY98, substantial shakedown runs and learning experience was gained. However, since DWPF has now operated for approximately 3 years in a full sludge only production mode, it is appropriate to update the production capacity based on the knowledge of the plant behavior versus the initial design capacity calculations.

For reference, Research and Development (R&D) work conducted in the late 1970's and early 1980's indicated that the average instantaneous pour rate for the DWPF melter should be 228 lbs./hr. This was based on scale up calculations from data derived from the small R&D melters with a specific chemistry. The melt rate is controlled by several key chemical and physical properties of the liquid high level waste and the molten vitrified waste:

- Glass oxidation state
- Molten vitrified waste viscosity
- Melter feed solids content
- Melter vapor space temperature as defined in the Safety Authorization Basis
- Quantities of combustibles in the melter feed

A limited study was also performed in 1989 that estimated the DWPF plant attainment to be approximately 75%, including melter outages.

Therefore, the initial design capacity for the facility was based on the following:

$$\frac{228 \text{ lbs. glass}}{\text{hr}} \times \frac{\text{canister}}{3{,}705 \text{ lbs. glass}} \times \frac{24 \text{ hr}}{\text{day}} \times \frac{365.25 \text{ day}}{\text{yr.}} \times \begin{matrix}75\% \\ \text{attainment}\end{matrix} = \frac{405 \text{ canisters}}{\text{yr.}}$$

However, based on the production capability that has been accomplished for Batch 1A and for Batch 1B, it does not appear that this type of production capability will be accomplished without modifications being implemented. The limitations being experienced in production are primarily related to:

- the higher oxidation state of the sludge feed relative to the original test data and its impact on production
- foaming of the melter cold cap
- pressure surging of the off gas system
- lowering of the melter vapor space temperature

These limitations result in a lower pour rate.

Based on the first two macro-batches of feed that have been processed in the DWPF, the following production capacity has been accomplished to date:

Batch 1A Results (5/25/98 to 9/15/98)

$$\frac{161 \text{ lbs. glass}}{\text{hr}} \times \frac{\text{canister}}{3{,}800 \text{ lbs. glass}} \times \frac{24 \text{ hr}}{\text{day}} \times \frac{365.25 \text{ day}}{\text{yr.}} \times \begin{matrix}68.0\% \\ \text{attainment}\end{matrix} = \frac{253 \text{ canisters}}{\text{yr.}}$$

Batch 1B Results (12/3/98 to 3/30/99)

$$\frac{146 \text{ lbs. glass}}{\text{hr}} \times \frac{\text{canister}}{3{,}800 \text{ lbs. glass}} \times \frac{24 \text{ hr}}{\text{day}} \times \frac{365.25 \text{ day}}{\text{yr.}} \times \begin{matrix}77.1\% \\ \text{attainment}\end{matrix} = \frac{260 \text{ canisters}}{\text{yr.}}$$

The melt pour rates of 161 and 146 lbs. of glass per hour for Batch 1A and 1B, respectively, were obtained by evaluating a stable period of operating time (dates shown above) and is considered representative of the macro-batch.

As you will note above, the pounds of glass per hour that was poured during Batch 1A was greater than is currently being poured in Batch 1B. This is caused by the differing chemical composition of the two batches. For example, Batch 1B feed is more viscous than Batch 1A feed and is therefore predicted to have a lower melt rate based on development data.

During the overall mission of the HLW Program, the chemical composition of the feed batches will change each time a new sludge batch is processed. The average pour rate in Batch 1A and 1B ranged from 146 to 161 lbs. of glass per hour. The feed composition of these two batches is relatively consistent with the future batches remaining to be processed. Therefore, we predict the average pour rate for the future batches to be approximately 155 lbs. of glass per hr. The attainment percentage in Batch 1A and 1B ranged from 68.0% to 77.1 % attainment. As you will note, as we have become more knowledgeable of plant operations and implemented improvements (*e.g.*, improved cold cap management, SRAT Lab aliquotting, etc.), this percentage has increased. Based on this learning curve, we predict that in the future an attainment percentage of 83% can be maintained (not including melter outages). Therefore, based on our current knowledge of DWPF operations, we currently predict the following production capacity for the facility during full production years.

$$\frac{155 \text{ lbs. glass}}{\text{hr}} \times \frac{\text{canister}}{3{,}800 \text{ lbs. glass}} \times \frac{24 \text{ hr}}{\text{day}} \times \frac{365.25 \text{ day}}{\text{yr.}} \times \begin{matrix}83\% \\ \text{attainment}\end{matrix} = \frac{297 \text{ canisters}}{\text{yr.}}$$

The production rate above, however, does not include any deduction from the attainment percentage to incorporate a melter change out that will be necessary at certain times in the processing at DWPF. To date, DWPF has not experienced a melter failure and therefore, there is no plant experience to improve the assumed timeframes for predicting melter failures or a melter outage.

DWPF is pursuing initiatives to improve production capacity. The programs associated with a more reducing feed and its impact on Technical Safety Requirement flammability limits and melter vapor space kinetics should provide an increase in the melt rate. An ongoing analysis of the feed preparation limits and sample analysis impacts will better define the next restricting operation. Sample analytical time requirements are not expected to present a near term restriction for Sludge Only operation, but could impact production at higher melt rates.

Due to the integrated nature of the HLW System, it will be necessary to increase the output of Waste Removal and Pretreatment Operations in order to support the increase in DWPF production capacity. These overall system production increases are multi-year efforts in order to allow sustained production above the 200 cans/year average.

Melter Pour Spout Inserts

Melter pour spout inserts continue to perform well and support DWPF canister production rates by virtually eliminating problems with glass "wicking." A replaceable insert is installed remotely in the melter pour spout. Its function is to provide a clean, sharp "knife edge." The knife-edge is the last surface that the molten glass contacts before it free falls through the bellows and into the canister. Glass pouring eroded the original melter pour spout knife-edge, leaving a rounded surface that caused the glass pour stream to waver. This caused the glass to contact, cool, and solidify on the inside surfaces of the lower pour spout and bellows liner. This greatly reduced DWPF attainment, because melter feeding and pouring had to be interrupted while the glass was removed from the affected surfaces. However, the fresh, sharp edge provided by each new insert allows the glass to flow smoothly and drop cleanly through the bellows and into the canister. The first melter pour spout insert was installed in May 1997. Operating experience shows that each insert lasts for approximately 60 canisters, before it must be removed and replaced.

Production Plan

DWPF is currently processing Sludge Batch #1B from Tank 51. The last feed from Sludge Batch 1A was received in September with the completion of processing in October 1998. Sludge Batch 1B is expected to last until 6/01 based on a 200 can/year production rate. For additional information on preparation of future sludge batches, refer to Appendix H.5, Sludge Processing.

Several facility modifications were implemented to support production improvements:

The DWPF sludge-only flowsheet was revised to eliminate the addition of simulated precipitate hydrolysis aqueous (PHA) in FY98. By eliminating the addition of simulated PHA, DWPF improved the Sludge Receipt and Adjustment Tank (SRAT) batch preparation time by 40%, eliminated the need to prepare and sample the batches of simulated PHA, and reduced the volume of recycle generated by 11,000 gallons per SRAT batch cycle. This reduced the volume of recycle transferred to the Tank Farm. This improvement continues to support high production rates at minimum H_2O generation.

The Slurry Mix Evaporator (SME) operating sequence was modified to increase productivity. The spent decon frit and wash water resulting from canister decontamination is recycled to the SME for incorporation in subsequent glass batches. Previously, canister decontamination was a time-limiting item in melter feed preparation, because the SME could only accommodate spent decon frit and wash water at a rate of two canisters per day. However, under the new operating sequence, the SME can now accept up to 6 canisters' worth of spent decon frit and wash water per day. This improvement was made without the need for any facility modifications and continues to operate success fully.

The dilute nitric acid decon system presently in use in the Remote Equipment Decon Cell (REDC) and the Contact Decon Maintenance Cell (CDMC) has been augmented by a carbon dioxide pellet system. This system assists equipment decontamination in these two cells by generating streams of high-pressure air bearing the CO_2 pellets. Initial testing has been successful. Implementation of this system would reduce one source of aqueous waste in DWPF, because the spent CO_2 pellets will sublime (phase change directly from solid to gas). This helps reduce the volume of decontamination related recycle waste being returned to the Tank Farms, thereby reducing the burden on Tank Farm Evaporators and storage space.

Mock-up testing of laboratory aliquotting has been completed and the method implemented for the SRAT related analysis. Side by side testing is underway for SME aliquotting samples. Initial results are very encouraging. Successful implementation will increase DWPF analytical Lab capacity.

Several additional facility modifications were completed to prepare DWPF for processing of Batch 1B sludge. The Melter Feed Tank interlocks were upgraded and seismically qualified to ensure that, in the event of an earthquake, feeding to the melter will stop. Motor Control Centers for Zone 1, 2, and 3 Ventilation were seismically qualified to ensure that, following an earthquake, forced air ventilation into the Vitrification building can be shut down while exhaust fans continue to operate. This will maintain negative pressure inside the Vitrification Building, thereby reducing the risk of an unfiltered release of radioactive material. A safety class air purge supply to the Slurry Mix Evaporator Condensate Tank (SMECT) was added to maintain a dilute vapor space. This will prevent the SMECT vapor space from reaching the lower flammability limit in the event of a solids carryover from the Sludge Receipt and Adjustment Tank (SRAT) or the Slurry Mix Evaporator (SME), which could result in hydrogen generation.

Since startup, yearly production rates have varied as follows:

FY96	64 canisters (actual)
FY97	169 canisters (actual)
FY98	250 canisters (actual)
FY99	250 canisters per year (72 poured to date)
FY00-FY24	200 canisters per year

The higher curie content of Sludge Batch 2 will require the safety class nitrogen missile-shielding project to be completed before this sludge batch can be processed in DWPF. This modification is needed to maintain compliance with the DWPF safety analysis.

DWPF will continue sludge-only processing until precipitate feed is available from the salt processing facility. At the time of this Plan, the salt processing flowsheet remains under evaluation. This Plan assumes that salt processing will resume in FY10.

With the delay in the start of salt processing to FY10, this Plan shows that the processing of salt-only canisters will be required after all the sludge waste has been processed. The production of salt only-cans will require additional evaluation to ensure a glass can be made that meets requirements (durability, heat loading, etc.). Development of a glass formulation with new frit and/or glass forming chemicals will be required.

The DWPF production rate is impacted in future years by two major factors. First, it is desirable to feed sludge and salt streams at a rate which allow the two inventories to be depleted around the same time. With the delay in salt processing to FY10 and while maintaining a 200 canister per year sludge only feed rate, this is no longer possible. Second, sufficient Waste Removal funding must be provided to maintain or exceed the planned DWPF production rate of 200 canister per year. Waste Removal must be funded so that modifications can be made to support the removal of sludge or salt from waste storage tanks.

Replacement Control Systems

The current distributed control system (DCS) at DWPF is over 14 years old. The system is approaching the end of its useful life. Therefore, plans have been initiated to procure and install a new system in mid 2002 consistent with funding availability.

Replacement Melters

Ongoing vitrification operations will require periodic melter replacement. SRTC predicts that noble metals deposition (causing the electrodes to short-circuit) may be the most likely cause of melter failure. Other possible causes of melter failure include the failure of non-replaceable heaters in the riser, pour spout and vapor space. SRTC also predicts that melter life expectancy will average about two years. The melter presently in service (melter #1) has been in operation for 4.5 years (3 years radioactive — 1.5 years simulated). Noble metal content of the feed during this period has been very low (<10% of design basis). Replacement melter projects are planned accordingly. Melter replacement outages are expected to last approximately 6 months.

However, because of a Site Treatment Plan commitment to produce an average of 200 canisters per year (refer to Section 5.3 for more details), DWPF's annual production rate targets will not be decreased during years in which melter outages occur. In fact, DWPF's instantaneous canister production rate must be increased beyond currently demonstrated levels to compensate for production downtime associated with a melter replacement outage. To meet the STP commitment of 200 canisters per year, the instantaneous DWPF production rate (200 cans x 30 month window / 24 months production) must be 250 cans. DWPF is presently operating at essentially that rate. Funding for DWPF attainment improvements has been allocated in the outyears under the Path to Closure Plan Project SR-HL12, "HLW System Removal." Studies are underway to determine the scope of these improvements.

Melter #1 is in service. It began operating in June 1994, was used for DWPF startup testing, and is currently in radioactive service. At the time of this Plan, Melter #1 has already reached 225% of its nominal two-year life expectancy. The long service life of Melter #1 may be attributed, at least in part, to the low noble metals content of Sludge Batch #1A. The noble metals content of Sludge Batch #1B is higher. Melter #1 will remain in service as long as it operates normally.

Melter #2 is on site. Construction modifications are complete, and the melter itself is ready to install. Some modifications to the Melter #1 Storage Box and the Failed Equipment Storage Vault crane are being evaluated, but are currently unfunded. Plans and procedures to conduct the melter outage are task ready, should Melter #1 fail. However, because Melter #1 will be allowed to operate until failure, the Melter #2 replacement outage is not specifically scheduled at this time.

The **Melter #3** vessel and frame and most major components are on site. Assembly began, but is currently on hold. The melter refractory has been installed, dried, and laid up inside the 105-P Reactor building. The subcontract for assembly of the pour spout is on hold; SRS now plans to do the final modifications in-house, based on lessons learned from Melter #1 pouring experience. Thermocouples will be ordered, pending availability of funding. Once all components are on site, final assembly of Melter #3 is expected to take 6 months. Assuming funding is available when needed, overall lead time for a replacement melter project, from project inception through actual installation in the DWPF, is ~5 years.

Melter #4 procurement activities should be initiated soon. The preferred fabricators of key melter components are no longer in business. Qualified fabricators in specialized fields must be identified.

Failed Equipment Storage Vaults

Failed Equipment Storage Vaults (FESVs) are repetitive projects required to sustain ongoing DWPF operations. Failed melters and other large failed DWPF equipment which are too contaminated to dispose in the site's Burial Ground will be contained in engineered boxes and temporarily stored in the DWPF FESVs. Each FESV can store one failed melter. Over the life of the HLW program, approximately 10 FESVs will be needed. FESVs #1-2 are already operational in DWPF. Additional FESVs line items are scheduled on a just-in-time basis. FESVs #3-4 will be available for startup in FY03, FESVs #5-6 in FY08, FESVs #7-8 in FY13, FESVs #9-10 in FY18, and FESVs #11-12 in FY23.

Recycle Handling

As part of normal operations, DWPF generates an aqueous recycle waste stream originating from three sources in the DWPF process: the primary (or back-up) Melter Off-Gas Condensate Tank, the Slurry Mix Evaporator Condensate Tank, and the Decon Waste Treatment Tank. These streams are collected in the Recycle Collection Tank (RCT) for transfer to the Tank Farm. The contents of the RCT are adjusted with corrosion inhibitors prior to transfer.

Melter Off-Gas Condensate Tank (OGCT): The melter is not designed to accommodate thermal cycling; that is, once it has been brought up to temperature, it remains heated - containing a molten glass pool, even when waste feeding and glass pouring are temporarily suspended. Because the melter will always contain molten glass, the melter ventilation system must also remain operational. Several components of the melter off-gas system, including the offgas film cooler and the steam atomized scrubbers, use steam to cool and decontaminate the offgas before release to the Vitrification building exhaust system. Together, these components generate an aqueous waste stream that is collected in the primary (or back-up) OGCT. Although steam flow to the film coolers is reduced when melter pouring is suspended, at least one steam atomized scrubber operates all the time. Therefore, a portion of the recycle stream volume is generated at all times, regardless of waste processing rates.

During melter feeding and pouring, additional recycle volume is generated. The slurry feed into the melter is 45-55 wt% water, which flashes to steam upon entering the melter. This portion of the recycle stream is directly proportional to DWPF attainment rate; at higher attainment rates, feeding and pouring are increased, so recycle volume increases.

Slurry Mix Evaporator Condensate Tank (SMECT): The SMECT collects contaminated condensate from the Slurry Mix Evaporator (SME), the Sludge Receipt and Adjustment Tank (SRAT), and the Formic Acid Vent Condenser. The amount of aqueous waste produced by the SME and the SRAT is determined by waste processing rates and the solids content of the feed streams. In general, at higher attainment rates, more recycle waste will be produced.

Decon Waste Treatment Tank (DWTT): Contaminated aqueous waste from equipment decontamination operations is collected in the DWTT. The DWTT Contents are pumped to the Recycle Collection Tank for subsequent recycling to the Tank Farm This flow is variable, and depends upon the frequency of decontamination operations.

Recycle Collection Tank (RCT): The primary (and backup) OGCT, the SMECT, the DWTT, and the DWPF Analytical Laboratory sample waste streams are collected in the RCT, which has a working capacity of 8,200 gallons. DWPF has no other capacity to store the recycle stream.

Transfer to H-Tank Farm: To support DWPF production, recycle transfers to the Tank Farm must occur daily. The normal HLW System configuration for these transfers uses the S- to H-Area inter-area line to the Low Point Pump Pit, then to the HDB-8 Complex, through HDB-7, and finally to Tank 43, which feeds the 2H Evaporator. The same route can also be used to transfer recycle into Tank 38 when necessary. A route through HDB-8 and HDB-5 also exists, which allows the DWPF recycle to be transferred to Tank 22 or, as an alternate, Tank 21. This will provide additional flexibility for the Tank Farms to accept DWPF recycle when Tank 43 is unavailable. After 3H Evaporator starts up, the DWPF recycle volume may be divided between 2H and 3H. For more details, refer to Section 8.2.2, "H-Tank Farm Evaporators."

Recycle Forecast

DWPF Engineering has developed an algorithm for predicting recycle generation rate. The algorithm is derived from recent operating experience, including demonstrated or anticipated results of ongoing efforts to reduce recycle volume; adjustments for coupled feed operation; planned program activities, and increasing waste generation from decontamination operations as DWPF equipment ages.

For sludge-only operation:

Recycle = 1.63 + 5.25*(Attainment)

recycle = the rate of recycle generation, on a continuous basis, in gallons per minute (gpm)
Attainment = DWPF operating rate, expressed as a cans/yr. production/500

Note that even at zero attainment, some recycle waste continues to be generated.

Once salt processing is operational, it is anticipated that an additional 320,000 gal/year of recycle will be generated from operation of the salt processing cell. This recycle is in addition to the amount resulting form sludge processing

Organic Waste Storage Tank (OWST)

Under the current recommended salt processing flowsheet (small tank precipitation), washed precipitate transferred to DWPF will contain cesium tetraphenylborate and potassium tetraphenylborate. DWPF will use a precipitate hydrolysis process to destroy the tetraphenylborate, because tetraphenylborate cannot be processed through the melter. The precipitate hydrolysis process will yield a side stream nominally referred to as "benzene," although it also contains approximately 15% other aromatic organic compounds and very low levels of radioactivity. The benzene will be steam-stripped in the Precipitate Reactor (PR), further decontaminated in the Organic Evaporator (OE), sampled in the Organic Evaporator Condensate Tank (OECT), and transferred outside the Vitrification building to the Organic Waste Storage Tank (OWST) via a welded, stainless steel overhead line.

The OWST is a double-shell, above-ground tank located southwest of the Vitrification Building in S-Area. The primary tank is constructed of 304L stainless steel, and has a capacity of 150,000 gallons. A floating roof inside the primary tank reduces evaporation of the organic liquid. The roof begins to float when the tank inventory reaches approximately 13,800 gallons. Therefore, a minimum heel of 13,800 gallons of benzene, once established, will always be maintained to limit benzene emissions. The vapor space between the floating roof and the fixed roof is padded with nitrogen gas, and ventilated through a HEPA filter. The secondary tank is constructed of carbon steel, and includes a leak detection system.

Essentially all benzene generated during cold chemical runs has been removed from the OWST. Although it is considered empty for RCRA purposes, the OWST still contains a very small quantity (about 15 gallons) of benzene and continues to be operated under RCRA and SAR requirements.

Mercury Disposal

The sludge contains mercury, which must be removed prior to vitrification. The recovered mercury is returned to the Separations facilities for re-use in their processes per a Memorandum of Understanding that became effective February 1, 1999

8.7 Glass Waste Storage

The canisters of vitrified HLW glass produced by DWPF are stored on-site in dedicated interim storage buildings called **Glass Waste Storage Buildings** (GWSBs).

GWSB#1 consists of a below-grade seismically qualified concrete vault that contains support frames for vertical storage of 2,286 canisters. The storage vault is equipped with forced ventilation cooling to remove radioactive decay heat from the canisters. A standard steel frame building encloses the operating area directly above the storage vault. A 5-foot thick concrete floor separates the storage vault from the operating area. The **Shielded Canister Transporter (SCT)** moves one canister at a time from the Vitrification Building to the Glass Waste Storage Building. It drives into the operating area, removes the shielding plug of a pre-selected storage location, lowers the canister into the storage vault, and replaces the shielding plug.

Of the 2,286 canister storage positions nominally available, 572 positions are currently unusable because the plugs are out of round relative to the floor liner. This poses the problem of potentially jamming a plug during removal or replacement. Of the 572, DWPF Engineering estimates that 450 plugs can be repaired, but the remaining 122 will be abandoned in place, because it is not cost effective to repair them. In addition, five positions are occupied by test canisters strategically located to monitor for possible corrosion. After the 450 plugs are repaired, GWSB#1 will have a working capacity of 2,159 usable storage locations. Funding is planned in FY02 and FY03 to repair these plugs.

GWSB #1 is currently in Radioactive Operation. At the time of this Plan, GWSB#1 was storing 554 radioactive canisters. If DWPF production proceeds at a rate of 200 canisters/year and the 450 presently unusable positions are recovered, GWSB#1 will reach capacity in FY07, as shown in Appendices H.6 and H.9. (Note that this Plan does not include potential storage of ~300 canisters from the West Valley Demonstration Project. For additional information on potential storage of West Valley canisters at SRS, refer to Section 10.5, below.)

The project to design and construct **GWSB #2** will begin in FY02 and will be funded over a five-year period. The project could be completed more quickly, but the five-year period levelizes the funding requirement. GWSB #2 design will be similar to GWSB #1, but the capacity of GWSB #2 will be sized (along with the reduced capacity of 2159 storage positions in GWSB #1) to accommodate the total number of canisters that will be produced at the Savannah River Site.

Assuming the Federal Repository will be ready to receive canisters in FY15 at a rate of 500 canisters per year and DWPF canister production continues at a rate of 200 canisters per year. GWSB #2 would be emptied and available for decommissioning in FY26. GWSB #1 would be emptied and available for decommissioning in FY25. SRS canister shipments to the Repository will be completed in FY26.

8.8 Effluent Treatment Facility (ETF)

The ETF treats the low-level aqueous wastes from the F- and H-Canyons and the F- and H-Tank Farms. The ETF provides enhanced environmental control over the previous practice of discharging liquid directly to seepage basins. Additional waste streams from Environmental Restoration and CIF are treated. After treatment at ETF, the wastewater is discharged to a permitted outfall at Upper Three Runs Creek.

Production Capacity: The ETF Facility includes process waste water collection tanks, treated water tanks, and basins to collect contaminated cooling water and storm water run-off. Treatment processes include pH adjustment, filtration, organic removal, reverse osmosis, mercury removal, and ion exchange. Recent operating experience indicates that average throughput is approximately 60 gpm, with a peak rate of 90 gpm for short periods.

Production Plan: ETF plans to treat 18,000,000 gallons of wastewater in FY99. At the time of this Plan, the facility has treated ~8,000,000 gallons (FYTD). ETF Concentrate is currently transferred to Tank 50 for storage prior to disposal in the Saltstone Facility.

8.9 Saltstone Facility

The Saltstone Facility treats and disposes the Salt Waste Processing filtrate stream and the ETF concentrate stream. The two low-level radioactive waste streams are treated by mixing the wastes with cement, flyash, and slag. The resulting grout is disposed by pumping it to engineered concrete vaults and allowing it to cure. The solidified waste form is known as saltstone.

Production Capacity: The Saltstone facility is normally staffed with one ten-hour shift per day, four days per week. About seven hours each day are available for salt solution processing at an instantaneous rate of up to 110 gpm. The other three hours each day are required for startup preparations in the morning and process shutdown at the end of the day. The plant utility is assumed to be 50% based on experience to date. Therefore, when feed is available, Saltstone can average ~23,100 gallons of salt solution processed per day or ~4,805,000 gallons of salt solution processed per year. This may be increased by modifying the shift schedule to allow more hours per day or days per week.

Production Plan: Since Salt Waste Processing began its re-revaluation of technology alternatives, only ETF concentrate has been available to Saltstone for processing The waste inventory in Tank 50, approximately 300,000 gallons, was processed in FY98. In FY99, the Saltstone Facility was placed in a partial lay-up mode. Partial lay-up reduces facility costs while minimizing potential deterioration of the plant, thereby minimizing the cost to resume operations in the future.

Tank 50 is currently operating as a dedicated receipt tank for the ETF evaporator concentrate. However, in FY04, Tank 50 will be de-inventoried to Saltstone and, afterwards, be unavailable for ETF concentrate storage due to its conversion to HLW storage service. Modifications will have to be developed and installed to allow ETF concentrate to be fed directly to Saltstone and to store ETF concentrate to accommodate Saltstone operations. A new Saltstone operation strategy must be developed to balance Saltstone processing versus planned receipts. The Saltstone operational requirements prior to Salt Processing startup is depicted, for the three budget cases, in the Appendices entitled "Near Term Saltstone Operations" (H.7, I.7, and J.7).

The future salt processing flowsheet is not known; therefore, the production requirements for Saltstone are not known. This Plan assumes salt processing will resume in FY10, and that the process will generate decontaminated salt solution similar to that planned for ITP. This Plan assumes Saltstone will alter its staffing plan to support production level through a two-shift operation.

Vaults: Saltstone operations require periodic construction of additional vaults, capping of filled vault cells and construction of permanent vault roofs. The required schedule for these repetitive projects is dependent upon the salt processing production plan. Each vault cell can hold 242,500 cubic feet of saltstone grout, or approximately 1 million gallons of Tank 50 salt solution. The construction and startup of new vaults supports planned Salt Processing production rates on a just-in-time basis.

Currently, construction of **Vault #1** is complete. Vault #1 has six cells, three of which are now filled and capped. A Rolling Weather Protection Cover (RWPC) protects the cell that is being filled.

Vault #4 grout filling is now in progress (one cell out of twelve is filled), in lieu of filling Vault #1. Eleven of Vault #4's twelve cells are available for grout disposal (Cell A was filled in 1989 when 10,032 Naval Fuels waste drums were disposed and grouted in place.) Construction of the Vault #4 permanent roof was completed in January 1997. The permanent roof provides several advantages over the RWPC: the cells can be filled to height of ~25 feet; more than one cell can be filled at a time; and the need to dispose of the RWPC as radioactive waste is eliminated.

The design for **Vault #2** is complete. Like Vault #4, Vault #2 has been designed with twelve cells. However, the Vault #2 design differs somewhat from the Vault #4 design in that it includes a permanent roof as an inherent part of the vault design and construction. The Vault #2 design is considered the prototype for future Saltstone vaults, if SRS chooses to continue building this type of disposal unit. (See the Saltstone Vault

Alternatives discussion below for more details.) However, to maximize budget efficiencies, this Plan assumes that 6-cell vaults will be used until a better planning basis is available.

Saltstone Vault Alternatives: The high cost of building replacement vaults has been identified as a potential area for cost reduction. The "Saltstone Vault Alternatives Study" identified grout disposal in a Z-Area landfill as a possible option. The subsequent "Pre-Conceptual Design Study for Z-Area Saltstone Waste Disposal Alternatives," dated October 1996, briefly described the design and construction of Geosynthetic Lined Waste Disposal Cells, which would be similar to municipal landfills. Based upon pre-conceptual design information, a cost comparison concluded that the landfill option could provide cost savings. However, feasibility studies of this option are on hold pending outcome of the Salt Waste Processing technology alternative study and scheduled resumption of salt processing.

8.10 Consolidated Incineration Facility (CIF)

The Consolidated Incineration Facility (CIF) treats and reduces the volume of incinerable hazardous, low-level radioactive and mixed SRS wastes. The EPA recognizes incineration as the Best Demonstrated Available Technology (BDAT) for treating certain hazardous components, some of which are contained in SRS waste streams. Incineration reduces the waste volumes by approximately 90%, reduces the chemical toxicity of the wastes, converts the residual ash to an environmentally immobile form, and eliminates the need for off-site shipments of untreated incinerable wastes. CIF incinerates a flexible variety of SRS-generated wastes in parallel, thereby reducing overall operating costs. Typical waste streams processed in CIF may include: job control wastes (gloves, protective clothing, spill cleanup materials); waste oils; contaminated aqueous wastes; used or excess solvents; organic wastes (including DWPF benzene, see details below); and a multitude of small volume legacy hazardous and mixed liquid waste streams arising from separations and clean-up projects around the site. CIF is a fundamental element in the SRS strategy to reduce the legacy of backlogged wastes, but also plays a key role in treating newly generated wastes as they arise, to avoid generating a new legacy problem.

The major components of the CIF comprise:

- A CIF Tank Farm for receipt, sampling and analysis of liquid wastes;
- The New Solvent Storage Tank (NSST) complex for the storage, sampling and analysis of PUREX solvent waste;
- A Box Handling area for the receipt and inspection of boxed solid wastes;
- The Incinerator itself, comprising a rotary kiln (RK) and a secondary combustion chamber (SCC);
- An off-gas treatment system, and
- A secondary waste stabilization system for incineration residuals.

Boxes of solid waste are fed into the RK by a mechanical ram feeder. The rotating action of the RK continuously tumbles the boxes to ensure thorough destruction at the operating temperatures of 1500 – 1700°F. Liquid wastes (with the sole exception of benzene from DWPF, see below) are also fed to the RK via one of two available injection systems, one for organic wastes with heating values above 7,500 BTU and one for aqueous wastes with lower heating values. Liquid wastes are either fed to the injection ports in small batches (4,000 gallons) from the CIF Tank Farm, or in the case of PUREX solvent in a large (25,000 gallon) batch directly from the NSST complex via a dedicated transfer system. Combustion gases generated in the rotary kiln are further incinerated in the SCC to ensure thorough destruction of the organic waste components. The SCC operates within the range 1800 – 2000°F. Under the currently permitted operating conditions, CIF has demonstrated 99.999% destruction of the hazardous organic constituents of waste.

CIF is available to provide essential support to the High Level Waste System by incinerating the DWPF benzene stream. An overhead, welded carbon steel, pipeline connects the DWPF Organic Waste Storage Tank (OWST) to the CIF. A branch connection from the loop line feeds the benzene directly to the secondary combustion chamber in CIF. A cost saving is achieved as a result of this design, because any benzene burned in the SCC reduces the amount of fuel oil necessary to maintain the SCC at its operating temperature.

CIF generates two residual waste streams: ash formed as a combustion product in the RK and blowdown liquids from the recirculation of scrubbing and cooling water in the off-gas clean-up system. These two waste streams are stabilized at CIF by encapsulation in a cement matrix to form a solid monolithic structure in 55-gallon drums. This stabilization process, known as the ashcrete process, uses a formulation and a process, which has been demonstrated to treat these waste streams to meet LDR treatment standards. The ashcrete (made from ash) and blowcrete (made from blowdown) products produced at CIF are disposed of in compliance with applicable EPA and SCDHEC regulations. For characteristic waste campaigns such as the current one, CIF has implemented a cost-saving and productivity improvement, whereby its blowdown waste is treated at the Effluent Treatment Facility (ETF), rather than being stabilized in drums at CIF.

Stabilized wastes derived from the incineration of listed mixed wastes are being temporarily stored at SRS prior to selection of a final disposal option in a RCRA permitted disposal facility. Wastes derived from the incineration of low-level radioactive waste or characteristic mixed waste are being disposed of at SRS in the E-Area vaults and trenches.

CIF conducted its Trial Burn in April 1997, and is awaiting the issuance by SCDHEC of a RCRA Permit modification to incorporate the results from the Trial Burn. In the interim, CIF is able to operate under its existing RCRA permit. Since radioactive start-up in April 1997, CIF has treated listed and non-listed mixed wastes in support of the Site Treatment Plan, along with legacy and newly generated LLW. For the next 10 years, CIF will continue to treat PUREX solvent in support of the STP commitment, legacy and newly generated LLW, an assortment of miscellaneous legacy mixed waste streams, and waste oils and other incinerable wastes from SRS. As the Environmental Management Integration (EMI) initiative bears fruit in the years to come, CIF is also a key facility in processing waste streams from across the DOE and DOD complexes.

9 Technology Development

Since 1996, DOE's Office of Science and Technology (S&T), EM-50, has provided technical support and co-funding to sites in the complex to develop and integrate technologies to accelerate cleanup of legacy waste. Several national focus areas are chartered to provide this support and the Tanks Focus Area (TFA) is specifically chartered to support the weapons complex high level waste programs. The SRS Site Technology Coordination Group (STCG) provides assistance to the site operating divisions in developing technology planning to support the DOE "Path To Closure" mission.

As part of this mission, the HLW division has successfully executed several key activities supported by the TFA. These activities include:

- Closure of Tanks 17 and 20
- Development and demonstration of several types of new waste retrieval tools that are expected to be deployed in Tank 19 and, possibly, future tanks
- Development and testing of a new generation of slurry pumps
- Deployment of a fluidic sampler in Tank 48.

The HLW division has ongoing activities and future planning in the following areas:

- Waste Pretreatment
- Waste Retrieval
- Tank Closure
- Vitrification
- Safety

A Technology Program Plan and development proposal has been prepared and submitted to the TFA as technology needs in each of these areas for FY00 and out years. A brief description of these plans and proposals are provided in the following paragraphs.

9.1 Waste Pretreatment Technology

As was described earlier in the Plan, the original baseline cesium removal process could not simultaneously meet both production and safety requirements. Over the next several years, a solid science and technology underpinning will be developed to make the final process selection and provide the data required for process scale up and design.

Science and technology roadmaps have been developed to document the planning for two candidate cesium removal processes (continuous tetraphenylborate precipitation and crystalline silicotitanate ion exchange). Ongoing and planned R&D is structured to execute the S&T roadmaps.

An Ion-exchange process using crystalline silicotitanate was investigated for removal of cesium from the DWPF recycle stream that would allow this stream to be diverted from the tank farm to the Effluent Treatment Facility. Early cost estimates based on very preliminary conceptual flowsheets suggested that such a process would be relatively inexpensive and easy to implement. However, recent cost and schedule estimates based on additional laboratory data and a more realistic process flowsheet are unacceptable. Additional work on this process has been suspended.

9.2 Waste Retrieval

Planning and execution of waste retrieval is an ongoing activity within HLW.

In the previous and current fiscal years, several waste retrieval tools have and continue to be developed and tested to support retrieval and tank closure. These tools include:

- Flygt mixers as low cost alternatives to slurry pumps
- Pitbull waste removal pumps capable of removing waste within approximately one inch of the tank bottom
- A remotable tank bottom crawler and water spray system for tank cleaning

SRS expects to initially deploy these tools to support planned waste removal activities in Tank 19 and evaluate for subsequent deployment in future tank retrieval.

Transfer of tank cleaning technology from the Russian nuclear program is currently underway. The Russians have been very successful using chemical cleaning technology and preliminary results for caustic sludge look encouraging. This technology has the potential for addressing cleanout of tanks having interior obstructions that would interfere with mechanical cleaning.

A long life fluidic mixer pump has been developed and fabricated for deployment this fiscal year in F Area Pump Tank 1. This mixer pump was developed by AEA Technologies and tested in their facilities as part of an EM-50 program to transfer British technology. Fabrication and installation of the pump was partially funded by the EM-50 Accelerated Site Technology Deployment (ASTD). Additional mixer pumps of this design will be evaluated for the four canyon waste receipt pump tanks.

A fluidic sampler similar to the design of the Tank 48 sampler is currently being fabricated and is planned for deployment as a sludge sampler for Tank 40.

Pipeline blockage detection and removal systems are planned and under development in cooperation with TFA, Florida International University (FIU), and the Federal Energy Technology Center (FETC). A test facility has been developed at FIU to test several industrial prototype systems. Successful detection and blockage removal systems will be prestaged for deployment in the complex in the event of a pipeline blockage.

The development of remotable systems to decontaminate and disassemble contaminated process equipment in the Tank Farm and DWPF will be initiated in FY00. At present disposal of large pumps, jumpers, etc., is expensive and requires large burial boxes.

9.3 Tank Closure

The lessons learned during closure of Tank 17 and 20 are being used in the planning for future tank closures. The reducing grout formulation is being modified to improve performance and reduce cost. Performance Assessments for the composition of future candidate tanks indicate that technetium will be the radionuclide that will dominate the extent and cost of tank cleaning to meet closure criteria. This problem extends across the complex, and a comprehensive program is being initiated in FY00 to develop technology to better remove, holdup, or immobilize technetium.

9.4 Vitrification

With sludge batches 1A and 1B, waste loading in DWPF glass is limited to about 26% waste oxides. A 2% increase in waste loading offers the potential for life cycle cost reduction equivalent to a year's DWPF production. R&D is underway to reduce the uncertainty bands on processing constraints that will provide an expanded operating window allowing both flexibility and increased waste loading. Data is being developed to reduce uncertainty in the liquidus constraint this fiscal year and R&D is planned for FY00 to address uncertainties in the model supporting the durability constraint.

DWPF has been operating for a number of years and opportunities have been identified for improvements in the process and glass melter design. The glass melter is one of the most expensive and complicated components in DWPF. Although the melter has exceeded its two-year design life, improvements in pour spout design and enhancements to accommodate future feeds are desirable. Recent problems with pour stream control have been solved with replaceable pour spout inserts. However, an improved overall design is needed to better accommodate erosion and corrosion. In addition, the present melter has operated at lower melt rates than were initially planned. The DWPF melter was designed before the potential for electrode shorting by an accumulation of noble metals was recognized. Although the melter is currently operating with low noble metal concentrations, a more noble-metal tolerant melter with higher melt rate capacity may be needed for future operation. A cooperative R&D program is planned and underway at FIU and at Clemson to address some of the design issues for the next generation of melters.

At the present DWPF glass canister production rate, design of a second glass waste storage building is scheduled to begin in FY02. The storage building will be available for use in FY07. An alternative glass canister storage technology has been proposed by Starmet, Inc. using storage modules fabricated from DUCRETE™ (concrete using depleted uranium aggregate). These proposed storage modules provide the required shielding and structural integrity for outdoor surface storage of glass canisters. This technology is currently under evaluation as a potential cost saving initiative.

9.5 Safety

The Tank Farm presently employs paper HEPA filters in the ventilation systems of the high level waste tanks. These paper filters become blinded by water vapor and have service life of about two years. Replacement of these filters involves occupational exposure and significantly contributes to the solid wastes generated by the Tank Farm. Moreover, a loaded paper filter represents a significant source term in the event a fire was to occur. The extent of loading is not known inasmuch as the trapped particulates are alpha emitters and cannot be easily monitored in their self-shielded filter geometry. A cooperative program is underway between SRS, TFA, and FETC to develop permanent washable HEPA filters using sintered metal filter media. Delivery of a prototype design is expected this fiscal year. Testing and development of a final design is planned for FY00 with deployment planned for FY01.

Several remote sensing and monitoring probes are under development in cooperation with TFA and the Characterization Monitoring and Sensing Technology (CMST) Cross Cut Area:

- A weight % solids probe is planned for deployment in Tank 40 to continuously monitor solid settling. This probe is designed to accurately monitor low weight % solids to determine the end point of sludge settling and is expected to reduce the cycle time for sludge batch washing.
- A weight % solids probe to monitor high weight % solids is also being developed to define the end point of sludge suspension during sludge removal. This probe is expected to be deployed in Tank 8.
- A combined corrosion probe and corrosion species probe is being developed using Hanford technology. This probe is expected to be initially deployed in FY00 and offers the potential to reduce operator exposure during normal sampling. It will also help in the management of our tank space by reducing the amount of caustic added to tanks to maintain corrosion control.

10 Support for Future Missions

A number of new programs are currently being evaluated or developed. Many of these programs have the potential to impact HLWD operations in the future. At the time of this Plan, there has been no decision to incorporate any of these programs into the baseline; therefore, none are included in the current Plan. They are addressed in this Plan for information only.

10.1 Can-In-Canister Plutonium Disposal

With the end of the Cold War, the U.S. has been left with an excess of weapons-grade plutonium. Up to 50 metric tons may be suitable for disposition via a process aptly titled "can-in-canister." At the time of this Plan, the preferred option is to construct a facility at SRS, probably within the existing F-Area, to convert the plutonium to a ceramic form. The plutonium ceramic would be placed in small stainless steel cans, measuring approximately 21" high and approximately 3" in diameter. These small cans could then be positioned in racks that would fit inside a full-size DWPF canister. HLW glass would then be poured into the DWPF canister as usual. The presence of the HLW glass would act as a deterrent to the unauthorized retrieval of the weapons grade plutonium. The filled canisters would then be stored in the Glass Waste Storage Building, pending transfer to the Federal Repository for long-term storage. This process was successfully tested at DWPF in 1996 (prior to the start of Radioactive Operations) using a simulated plutonium glass inside the small cans. Test results indicated that the HLW glass flowed around the cans without creating any significant void spaces, and cooled without forming many crystals. This option would require both salt and sludge processing at DWPF to provide the appropriate deterrent to unauthorized retrieval. This will not be available until mid FY10 in the Planning Case. Although no additional HLW glass would be produced, the plutonium ceramic, cans, and racks would occupy space that would have been filled with glass. Disposal of all 50 metric tons of plutonium would result in approximately 210 additional DWPF canisters. However, because this mission is still under development, these additional canisters are not included in the Plan at this time.

10.2 U-233 Processing

Oak Ridge and Idaho have significant quantities of U-233. Options will be evaluated to determine the optimum disposition of this material. Options involving SRS include:

- Dissolving the U-233 in the Canyons, diluting the U-233 with depleted U and sending the waste to the HLW tanks
- Dissolving the U-233 in the Canyons, adding neutron poisons, and sending the waste to HLW tanks already containing depleted U to reduce the additional glass logs generated by DWPF
- Separating Th-229 for future medical use
- Packaging breeder reactor fuel pellets in DWPF canisters similar to the plutonium can-in-canister proposal

All of these options will result in the production of additional DWPF canisters. The MD EIS for this program is currently scheduled to be complete in FY01 with the ROD in late FY01. Because this mission is still under development, these additional canisters are not included in the Plan at this time.

10.3 Pit Manufacturing

Savannah River Site is currently being considered for the large-scale pit manufacturing mission, which will augment the small lots facility currently under construction at LANL. This proposed facility will process return pits to make feedstock, cast the pit halves, and machine and assemble the components into WR certified pits. Project start-up would occur in the 2015 time frame. The facility would generate a maximum of approx. 33,600 gal./yr. of high level waste. It has not been determined if the high level waste would be treated as a part of the system described in this Plan or be converted to a Waste Isolation Pilot Plant (WIPP) compatible disposal form. No additional canisters are included in this revision of the Plan pending a definitive proposal to include this waste into the HLW waste stream.

10.4 Am-Cm Vitrification

Approximately 3,600 gallons of solution containing isotopes of Americium (Am) and Curium (Cm) are stored in F-Canyon Tank 17.1. These isotopes were recovered during plutonium-242 production campaigns in the mid- and late-1970's. The continued storage of these isotopes was identified as an item of primary concern in the Defense Nuclear Facility Safety Board's (DNFSB) Recommendation 94-1. No operating SRS facilities can presently be used to stabilize this material for safe interim storage and transportation to the heavy isotopes program at the Oak Ridge National Laboratory (ORNL). An analysis of several alternatives resulted in the recommendation to stabilize the Am-Cm solution in a high-lanthanide glass. The Multi-Purpose Processing Facility (MPPF) in the F-Canyon will be used for the vitrification process. Pretreatment operations will be performed in existing canyon vessels to separate actinides and lanthanides from other impurities (primarily iron, aluminum, and sodium) prior to the vitrification operation.

The pretreatment and vitrification processes will produce limited quantities of liquid waste when operations begin. Due to the short duration of this campaign (producing ~350 kg of glass over a 1 year period), the impact of this additional waste stream on F-Canyon operations is expected to be minimal. Material balance calculations on the final flowsheet have not been completed, but initial calculations suggest that total waste volume from the pretreatment and vitrification operations should be less than ~22,000 gallons. This volume will be treated through the traditional F-Canyon waste processing system (neutralized and evaporated), reducing the volume, and discharged to the F-Tank Farm. Operations are currently planned for the 2002-2004 timeframe, however, the project is being rebaselined.

10.5 Receipt of West Valley Canisters

The West Valley Demonstration Project (WVDP) in New York State began producing vitrified waste glass canisters in July 1996. Through FY99 the entire WVDP high level liquid waste inventory will have been immobilized in ~300 glass canisters. Currently, these canisters are being stored in a modified process building cell on the West Valley Site, pending availability of the Federal Repository in FY15. However, final decontamination and decommissioning of all WVDP facilities is expected to be complete by FY05, ten years before the Repository will be available. Initially it appeared that some cost savings could be achieved if the WVDP canisters were shipped and stored at the DWPF GWSB #1. Shipment of 100 WVDP canisters per year to DWPF was proposed to begin in FY02 and finish by FY04. However, further analysis cast doubt on the cost savings so that, in late FY98, it was decided not to pursue shipments to SRS at this time. Interim storage in New York State is the present proposal prior to final shipment to the Federal Repository. Until the Record of Decision is formalized, there remains a possibility of shipment to SRS. DOE would be responsible for other actions, including selecting the transportation method (rail or truck), obtaining agreements with affected states regarding transportation issues; providing a qualified shipping cask; obtaining a shipping contract; and implementing any necessary NEPA activities.

Appendix A - Acronyms

ACP	Accelerating Cleanup Plan
ADS	Activity Data Sheet
ALARA	As Low As Reasonably Achievable
AOP	Annual Operating Plan
BA	Budget Authority
BCP	Baseline Change Proposal
BDAT	Best Demonstrated Available Technology
BIO	Basis for Interim Operations
BO	Budget Outlay
CAB	Citizen's Advisory Board
CDMC	Contact Decontamination Maintenance Cell
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
Ci	Curies
CIF	Consolidated Incinerator Facility
Ci/gal	Curies per gallon
CLFL	Composite Lower Flammability Limit
CLSM	Composite Low Strength Material
CPES	Chemical Process Evaluation System
CST	Crystalline Silicotitanate
CTS	Concentrate Transfer System
DB	Diversion Box (e.g. HDB-8 – H Area Diversion Box #8)
DCS	Distributed Control System
DNFSB	Defense Nuclear Facilities Safety Board
DOE	Department of Energy
DOE-MD	DOE – Material Disposition
DWPF	Defense Waste Processing Facility
DWTT	Decon Waste Treatment Tank
EA	Environmental Assessment
EIS	Environmental Impact Statement
EM	Environmental Restoration and Waste Management, usually as a suffix to DOE
EPA	Environmental Protection Agency
ESP	Extended Sludge Processing
ETF	Effluent Treatment Facility
FESV	Failed Equipment Storage Vault
FETC	Federal Energy Technology Center
FFA	Federal Facility Agreement
FY	Fiscal Year
FYTD	Fiscal Year To Date
GS/PS	General Service / Production Service
GWSB	Glass Waste Storage Building
HHW	High Heat Waste
HLW	High Level Waste
HLWIFM	High Level Waste Integrated Flowsheet Model
HLWD	High Level Waste Division
HQ	Headquarters, usually as a suffix to DOE
INMM	Integrated Nuclear Material Management
ITP	In-Tank Precipitation
kgal	Kilo-gallons = 1,000 gallons
LCO	Limiting Condition of Operation
LHW	Low Heat Waste
LI	Line Item
LIMS	Laboratory Information Management System
LLW	Low Level Waste
MST	Monosodium Titanate
NEPA	National Environmental Policy Act
NMSS	Nuclear Materials Stabilization and Storage
NRC	Nuclear Regulatory Commission
NSST	New Solvent Storage Tank
OGCT	Off-Gas Condensate Tank
ORR	Operational Readiness Review
OYB	Out Year Budget
PCCS	Product Composition Control System
PCO	Process Controls of Operation
PHA	Precipitate Hydrolysis Aqueous
PIMS	Process Information Management System
PISA	Potential Inadequacy in Safety Analysis
PNNL	Pacific Northwest National Laboratory
ProdMod	Production Model computer program
PTC	Path To Closure
PUREX	Plutonium Recovery and Extraction
QA	Quality Assurance
R&D	Research and Development
RBOF	Receiving Basin for Off-site Fuels
RCRA	Resource Conservation and Recovery Act
RCT	Recycle Collection Tank
REDC	Remote Equipment Decontamination Cell
RHLWE	Replacement High Level Waste Evaporator (3H Evaporator)
RK	Rotary Kiln
ROD	Record Of Decision
SAP	Statistical Analysis Program
SAR	Safety Analysis Report
SCC	Secondary Combustion Chamber
SCDHEC	South Carolina Department of Health and Environmental Control
SEIS	Supplemental Environmental Impact Statement
SFD	Spent Fuel Division
SGF	Space Gain Factor
SME	Slurry Mix Evaporator
SMECT	Slurry Mix Evaporator Condensate Tank
SR	Savannah River - usually a suffix to DOE
SRAT	Sludge Receipt and Adjustment Tank
SRS	Savannah River Site
SRTC	Savannah River Technology Center
SS/SC	Safety Significant / Safety Class
SSC	Systems, Structures, and Components
STP	Site Treatment Plan
STPB	Sodium Tetraphenylborate
TEC	Total Estimated Cost
TFA	Tank Focus Area
Tk	Tank

Appendix A - Acronyms

TOPR	Task Order Proposal Request
TOST	Technical Oversight Steering Team
TPB	Tetraphenylborate
TPP	Technology Program Plan
TSR	Technical Safety Requirement
WAC	Waste Acceptance Criteria
WCS	Waste Characterization System
WMS	Works Management System
WRP&S	Waste Removal Plan and Schedule
WSRC	Westinghouse Savannah River Company
WW	Wash Water
Y2K	Year 2000 (as in computer compliance)

Appendix B – Glossary

General

HLW:

"High Level Waste" is the term used for highly radioactive waste that is a by-product from the production of nuclear materials. The waste storage tanks at SRS include Strontium-90, Cesium-137, Plutonium-238, Plutonium-239, Plutonium-241, and various Uranium isotopes. Due to the intense radiation fields, all waste storage tanks are built underground and all process work is done under radiological conditions, which can mean being done remotely or with proper shielding. The radiation field for direct exposure to this waste could be as high as 50 rem/hr (which in 6 minutes would exceed Federal yearly limits for a nuclear industry worker).

HLW System

The HLW System refers to the integrated series of facilities at SRS that convert HLW waste into glass. The system includes the facilities for storage, waste removal, pre-treatment, processing, and disposal.

HLW System Plan

This is the detailed planning document that describes the HLW System operations through the end of the program. The plan uses sophisticated computer models to schedule production, track chemical and radioactive materials, and model process flows.

Salt and Sludge

HLW stored in tanks can generally be characterized as being either "salt" or "sludge."

"Salt" Waste containing radioactive elements that are **dissolved in the waste liquid**. This generally contains Cesium and trace amounts of other soluble radioactive elements.

"Sludge" Waste containing **insoluble** radioactive elements that have settled to the bottom of waste tanks. This generally contains Strontium, Plutonium, and Uranium as metal hydroxides. The salt waste can be further characterized as being –

"supernate"	liquid containing dissolved radioactive salts in normal solution
"concentrated supernate"	supernate that has had liquid removed by evaporation
"salt cake"	waste that has crystallized out of solution.

A single tank can contain sludge, supernate and salt cake, although an effort is made to segregate the sludge and salt by tank. During waste removal, water is added to waste tanks and agitated by 45-foot-long slurry pumps to dilute or re-dissolve salts if it is a salt tank or to suspend the sludge if it is a sludge tank. The resulting liquid slurry is pumped out of the tanks and transferred to pre-treatment.

Salt Processing:

During salt processing, the highly radioactive constituents (especially Cesium) of the salt waste are separated out of solution and sent to DWPF for vitrification. The remaining liquid is "salt solution" (now without its highly radioactive constituents) which is low-level waste and can be safely sent to the Saltstone Facility for on-site treatment and disposal. Salt processing greatly reduces the volume of waste to be vitrified and sent for permanent disposal in a Federal repository.

Vitrified Glass

In a process called "vitrification" the HLW is blended with glass frit and melted at 2,100 degrees Fahrenheit to form a borosilicate glass. Once HLW is immobilized within the structure of the glass, it cannot dissolve out of the glass and migrate into the environment. Vitrification greatly reduces the environmental risk of HLW and converts it into a safe form for permanent disposal.

Appendix B – Glossary

Tank Space Terms

Freeboard

The empty space in a HLW storage tank. Freeboard is the total tank volume (at its operating limit) minus the volume of waste currently in the tank. Freeboard space is not necessarily available to be filled with new waste. A portion of freeboard may be reserved for tank farm emergency space, evaporator working space, or tank farm transfer space. Any empty space in a tank retired from service or otherwise not available to receive new waste is not considered freeboard.

Total HLW Freeboard

The sum of the freeboard in all of the HLW tanks.

Emergency Space

The freeboard that must be maintained in reserve in Type III/IIIA Tanks at all times in the unlikely event that a leak in a tank requires immediate transfer of waste from that leaking tank to this reserve space. The amount of emergency space that is reserved is set by regulatory commitments, is documented in TSR's and is currently set at 370" (1.3 million gallons) in each Tank Farm (a total of 2.6 million gallons).

Working Space

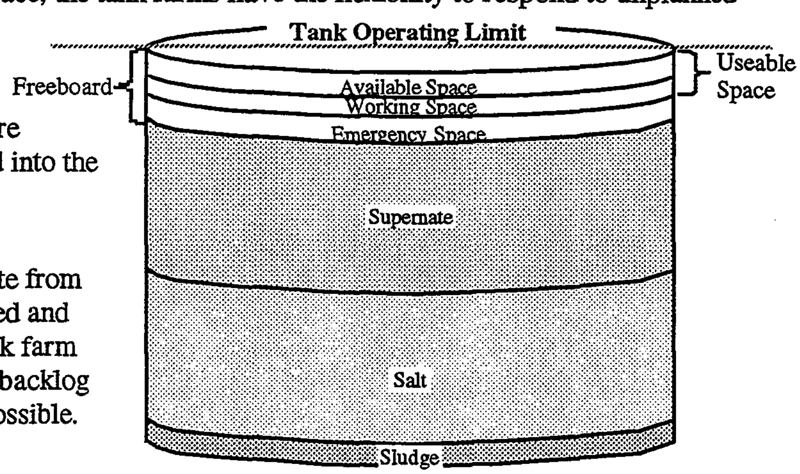
The minimum amount of freeboard required for normal tank farm operations, including waste receipts and evaporator operations. The amount of working space is determined by engineering estimates and operating experience. Working space is currently set at 200 kgals per evaporator system and 100 kgals per area for waste receipts (this translates to 500 kgals for H Area and 300 kgals for F Area). When the total amount of usable space in the Tank Farms approaches this Working Space minimum, then operating flexibility is significantly limited.

Available Space

The freeboard that can be used for receipt of incoming waste. Available space is calculated as total Freeboard less Emergency Space and Working Space.

Useable Space (Working Inventory)

The combination of working space and available space. This is the space the tank farms use on a routine basis. With adequate Useable Space, the tank farms have the flexibility to respond to unplanned outages, receive unplanned influent streams and fully support waste processing activities including DWPF recycle water and ESP wash water (where large receipts of wash water are received into the Tank Farm over a short duration).



Backlog Waste

Unconcentrated supernate. This supernate from past operations waiting to be concentrated and volume-reduced by evaporation. The tank farm evaporator systems are working off this backlog of unconcentrated waste as quickly as possible.

Concentrated Liquor

Supernate that has been evaporated to a specific gravity of 1.45 or greater, thus reducing its volume and minimizing the tank farm space it uses.

Appendix C - HLW System Priorities

1. Maintain operating facilities in a safe and production-ready condition:
   1a. Safeguard health and safety of workers and public
   1b. Continue stewardship of current waste inventories
   1c. Implement improvement programs/projects critical to 1a and 1b

2. Support critical Site missions (i.e., DNFSB 94-1):
   2a. Operate Evaporators and Tank Farms as required to provide receipt space for Canyon waste and DWPF Recycle
   2b. Operate ETF to support Canyons, Tank Farms and Evaporators

3. Comply with the approved FFA Waste Removal Plan and Schedule (i.e., empty and close all old-style tanks by 2022)
   3a. Support Tank 19 closure to meet commitment date of FY03
   3b. Support Tank 18 closure to meet commitment date of FY04

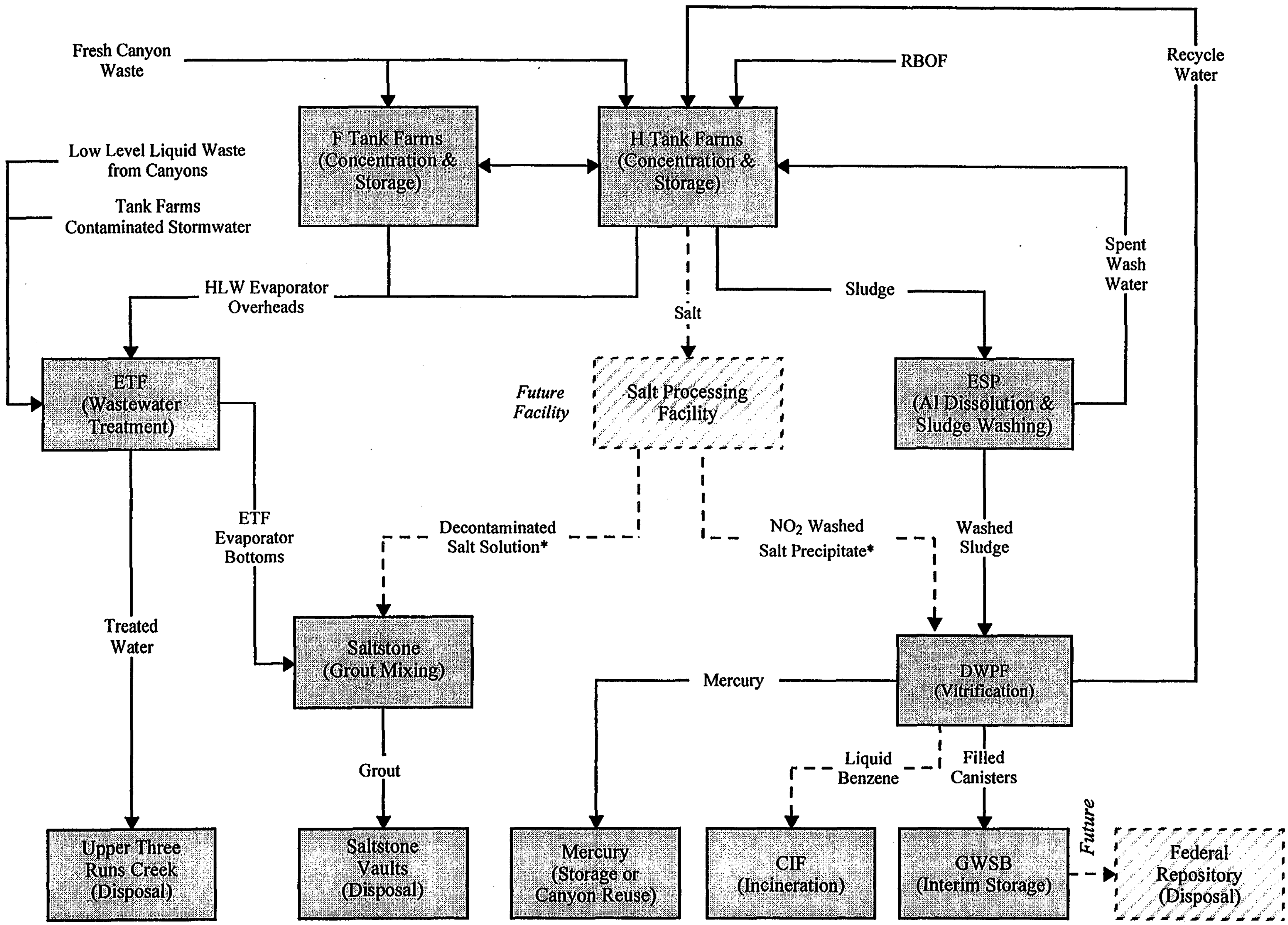
4. Near-term compliance with the Site Treatment Plan (i.e., maintain an average production of 200 canisters per year in DWPF)
   4a. Provide DWPF materials and analytical support to produce 200 canisters per year
   4b. Operate evaporators and Tank Farms to provide receipt space for DWPF recycle
   4c. Operate ESP to provide Tank 51 (Batch 1B) sludge feed to DWPF
   4d. Prepare Tank 8 and Tank 40 sludge (Batch 2) feed to DWPF
   4e. Implement strategy to remove the Tank 42 heel to Tank 40
   4f. Prepare Tank 40 equipment for sludge processing
   4g. Operate CIF
   4h. Start up the RHLWE to evaporate ESP wash water generated during Batch 2 processing
   4i. Support Salt Processing alternative selection process

5. Mid-term strategy to support Canyon missions and DWPF production:
   5a. Implement Tank Farm Space Management team recommendations
   5b. Support Salt Processing design activities on selected alternative
   5c. Prepare Tank 49 as a concentrated waste storage tank
   5d. Evaporate backlog supernate to create space in the Tank Farms
   5e. Prepare sludge batches to maintain continuity of DWPF operations (Batch 3, Tks 7, 11; Batch 4, Tks 4, 7, 15, 18, 19)
   5f. Install aluminum dissolution equipment on Tank 51

6. Long-term strategy to ensure continuity of DWPF operations, with both sludge and salt:
   6a. Prepare Tank 50 as a concentrated waste storage tank
   6b. Install aluminum dissolution equipment on Tank 40
   6c. Continue sludge processing to maintain continuity of DWPF operations (Batch 5-9)
   6d. Prepare Tanks 6-8 for re-use as concentrated waste storage tanks
   6e. Complete design, construction and startup of Salt Processing facility

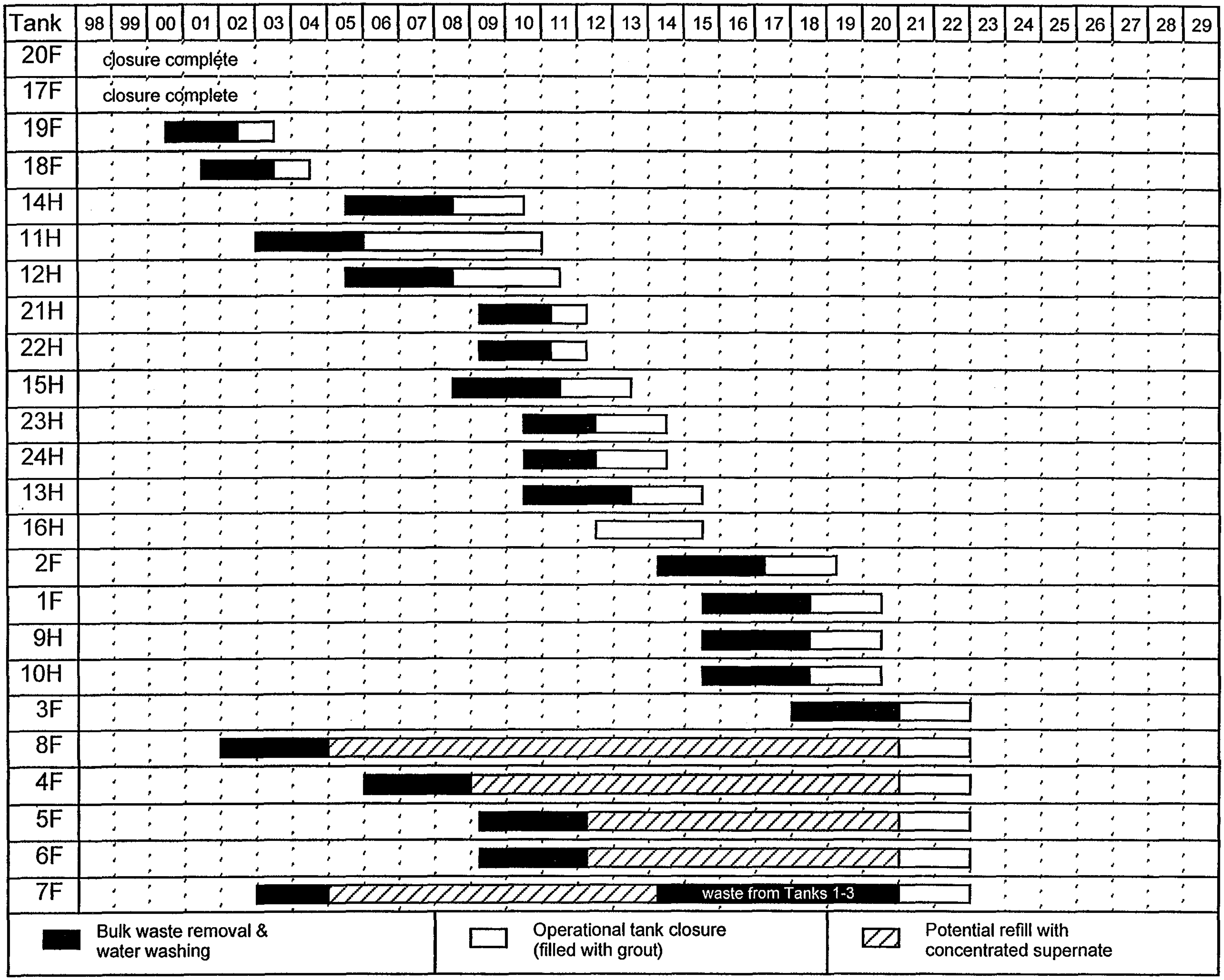
7. Develop new technologies that have a strong potential to reduce cost
8. Accelerate operation of the HLW System and thereby reduce program duration and life cycle cost
9. Develop and implement tank and facility closure methods
10. Perform engineering, technical and planning activities that reduce programmatic risk

Appendix D - Simplified HLW System Flowsheet (Small Tank TPB Precipitation)

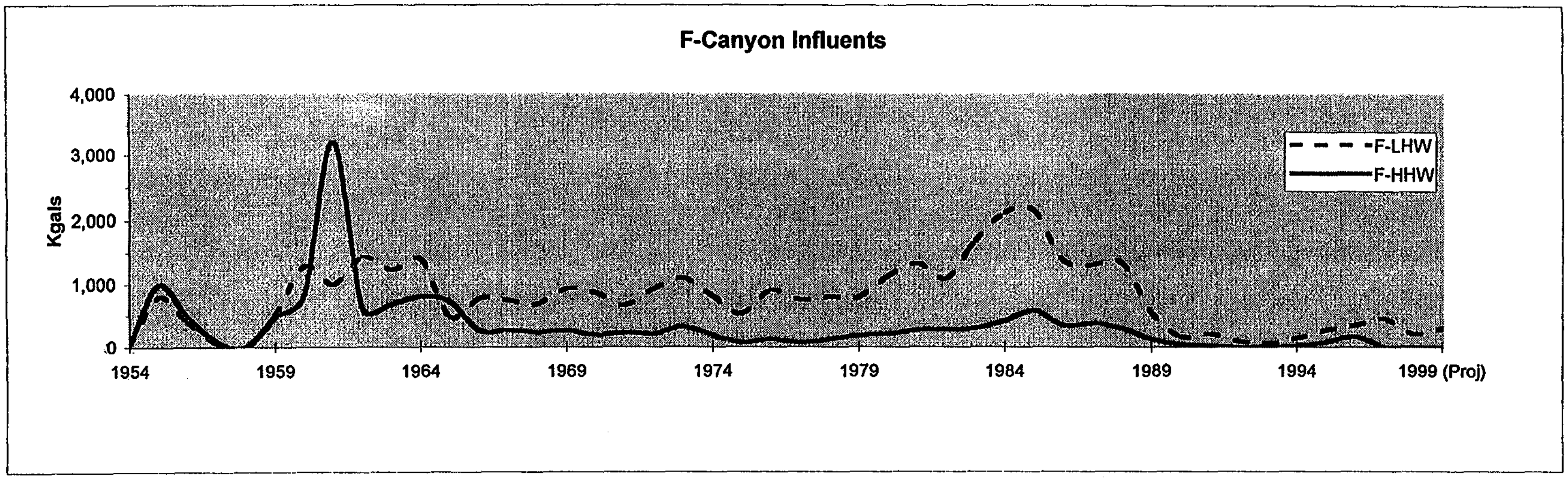


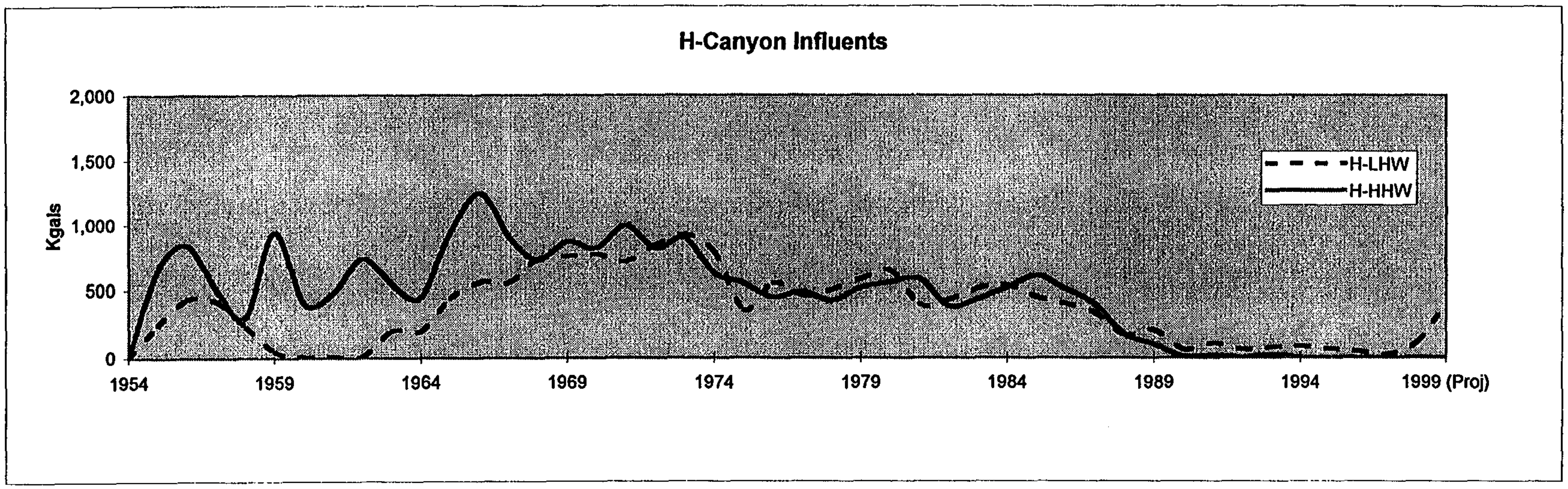
* These streams are based on the Small Tank Tetraphenylborate Precipitation process. Actual streams may vary based on the Salt Processing alternative chosen.

Appendix E - Approved FFA Waste Removal Plan & Schedule



Appendix F - Historical Tank Farm Influents and Effluents





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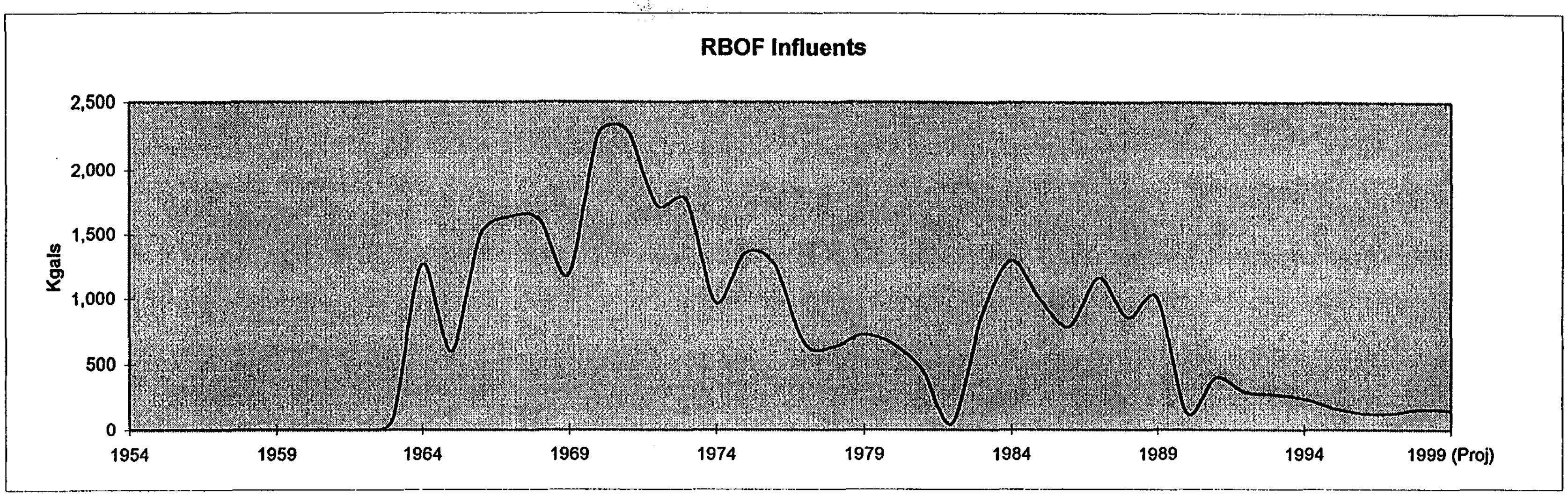

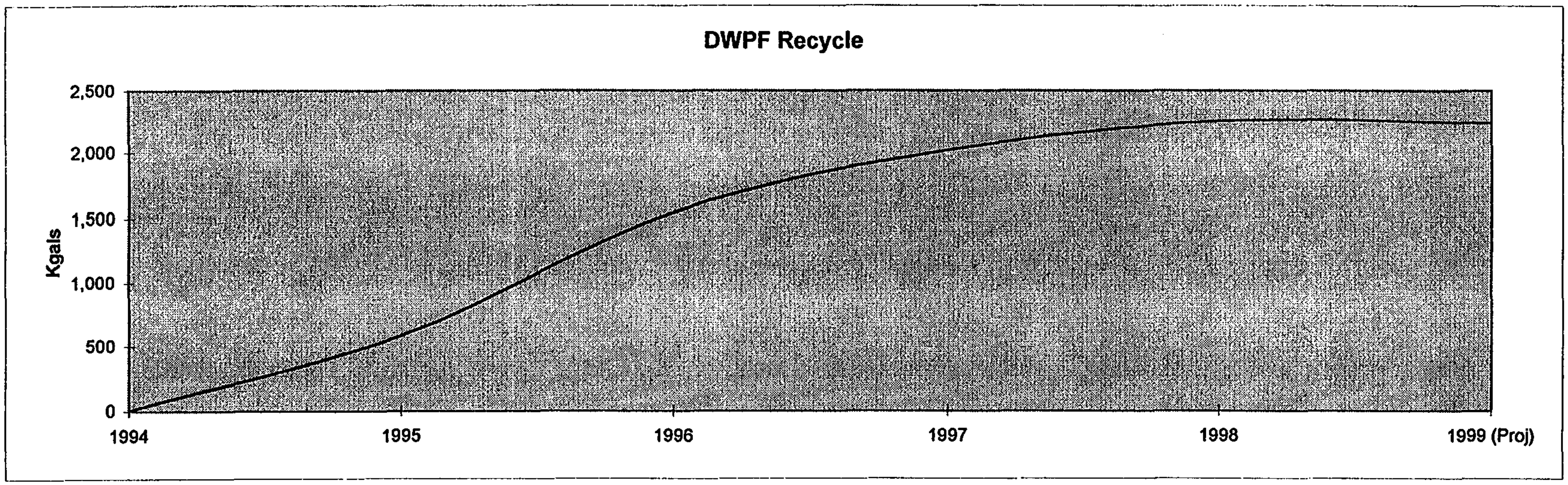

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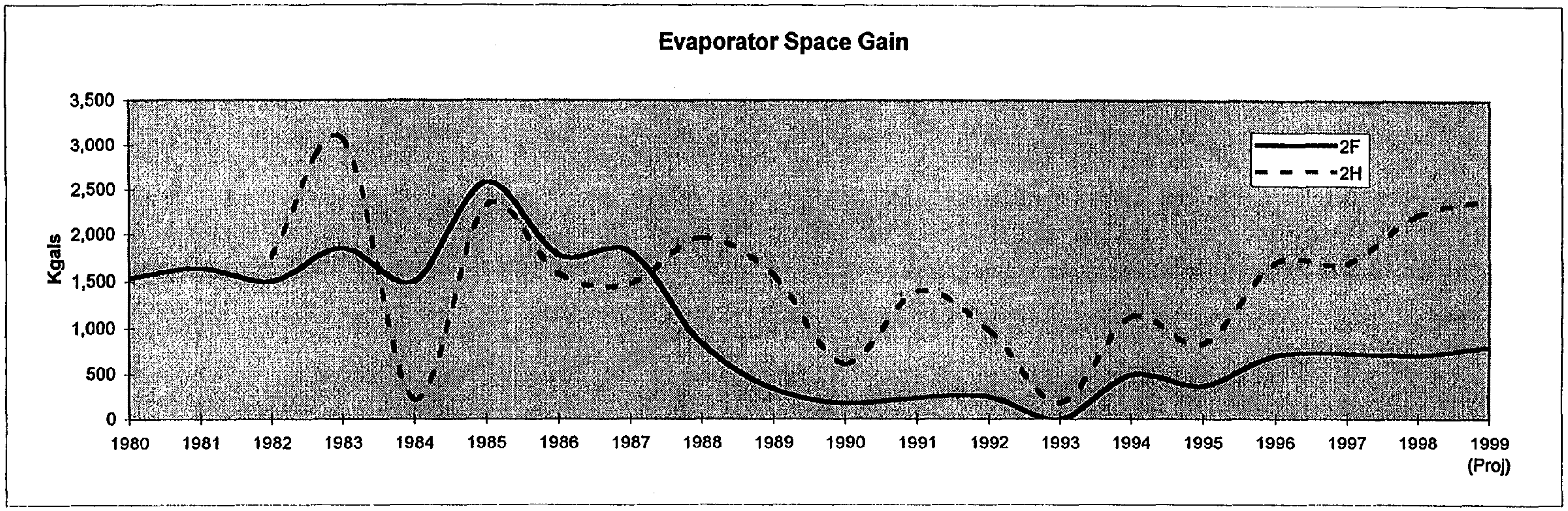
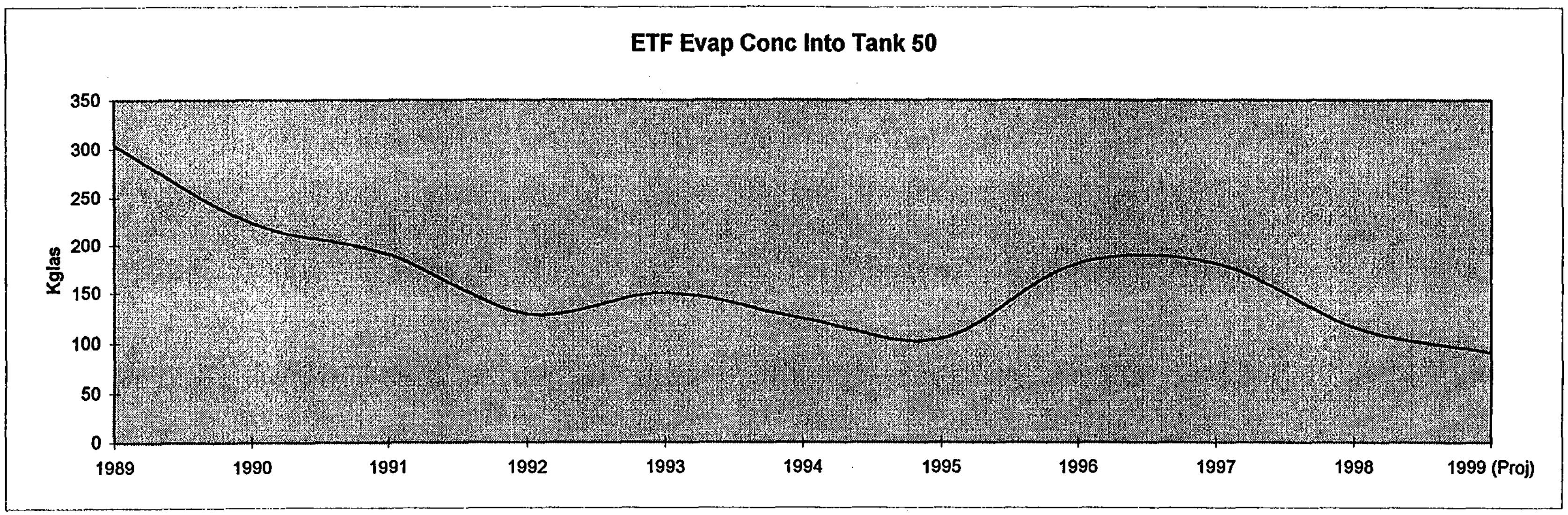
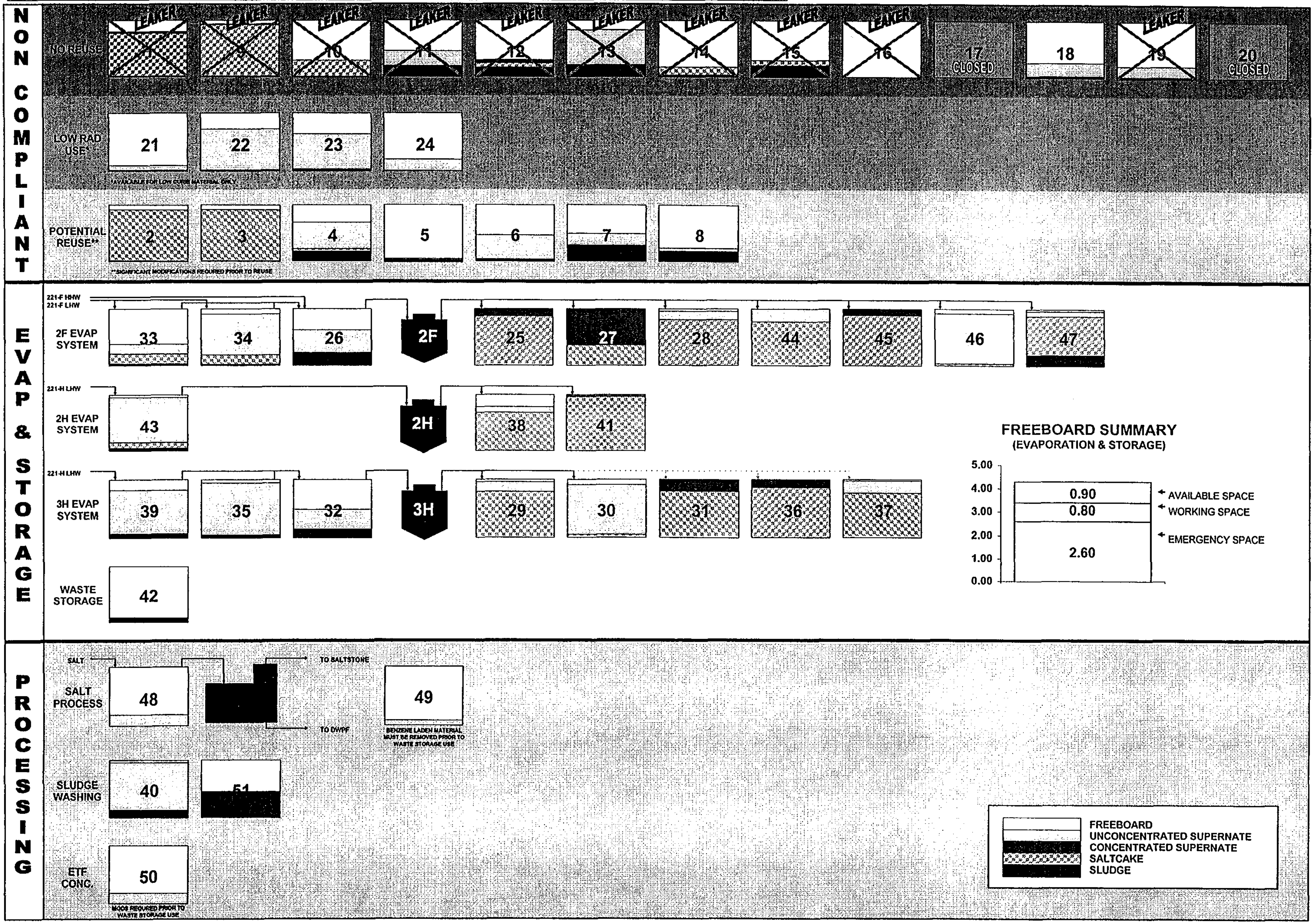




Appendix G - High Level Waste Tank Usage

DATA DATE: 1/22/99



Appendix H.1 – Funding (Planning Case)

Budget Authority in Escalated Dollars

Project	Title	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13
HL-01	**H Tank Farm**															
	H Tank Farm Operations	84,057	87,851	98,861	99,353	101,498	102,466	103,354	106,145	107,752	110,661	113,649	112,627	115,667	84,268	86,544
	LI: Replacement Evap	9,418	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-01 Total	**93,474**	**87,851**	**98,861**	**99,353**	**101,498**	**102,466**	**103,354**	**106,145**	**107,752**	**110,661**	**113,649**	**112,627**	**115,667**	**84,268**	**86,544**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-02	**F Tank Farm**	**57,762**	**60,737**	**65,367**	**66,292**	**67,544**	**55,973**	**55,605**	**57,106**	**58,648**	**58,939**	**60,530**	**62,165**	**62,442**	**64,128**	**65,860**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-03	**Waste Removal & Tank Closures**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	2,257	1,943	3,384	3,358	6,894	10,621	10,908	11,202	11,505	11,815	12,134	21,518	28,845	26,910	17,432
	WR: Tank Closure	636	-	-	5,957	20,218	13,853	-	5,614	6,863	2,841	13,244	11,411	38,656	41,188	-
	HL-03 Total	**2,893**	**1,943**	**3,384**	**9,315**	**27,112**	**24,474**	**10,908**	**16,816**	**18,368**	**14,656**	**25,378**	**32,929**	**67,502**	**68,098**	**17,432**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	**57,379**	**58,446**	**59,098**	**58,347**	**59,923**	**61,541**	**63,202**	**64,909**	**66,661**	**68,461**	**70,310**	**72,208**	**74,158**	**76,160**	**78,216**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-05	**Vitrification**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vitrification Ops	133,962	126,614	144,616	146,750	150,727	152,564	154,250	163,110	164,838	168,221	174,249	176,226	186,505	188,155	192,265
	Failed Equip. Stor. Vaults	-	-	2,293	1,185	10	-	45	1,914	1,955	-	-	76	2,201	2,196	-
	HL-05 Total	**133,962**	**126,614**	**146,908**	**147,935**	**150,737**	**152,564**	**154,295**	**165,024**	**166,793**	**168,221**	**174,249**	**176,301**	**188,706**	**190,350**	**192,265**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-06	**Glass Waste Storage**	**494**	**368**	**362**	**8,540**	**38,895**	**46,015**	**39,446**	**24,465**	**805**	**827**	**849**	**872**	**4,390**	**11,687**	**13,845**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-13	**Salt Disposition**															
	Salt Disposition Ops	13,624	42,129	36,681	-	-	-	-	-	-	-	-	35,512	71,448	73,377	75,456
	LI: Salt Alternative	-	-	78,330	121,500	123,600	126,628	132,740	139,452	174,972	171,105	115,010	46,160	-	-	-
	HL-13 Total	**13,624**	**42,129**	**115,011**	**121,500**	**123,600**	**126,628**	**132,740**	**139,452**	**174,972**	**171,105**	**115,010**	**81,672**	**71,448**	**73,377**	**75,456**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	**1,590**	-	**249**	-	-	-	-	-	-	-	-	-	-	-	-
HL-10	**LI: Storm Water Upgrades**	**2,044**	**4,430**	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-11	**LI: Tk Fm Services Upgrade II**	**1,390**	**4,314**	**9,118**	**6,217**	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-12	**LI: Waste Removal**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	LI: WR from Tanks	25,127	14,134	43,637	38,832	31,345	34,675	37,214	44,874	56,918	51,013	60,314	50,259	34,325	47,545	54,276
	LI: Vit Upgrades	-	299	1,152	-	13,170	13,526	13,891	14,266	14,651	11,285	17,385	11,903	18,336	18,832	19,340
	LI: Pipe, Evaps & Infras.	-	-	936	6,191	10,191	11,324	4,326	-	-	-	-	-	-	-	-
	HL-12 Total	**25,127**	**14,433**	**45,724**	**45,024**	**54,707**	**59,524**	**55,431**	**59,141**	**71,570**	**62,298**	**77,699**	**62,162**	**52,661**	**66,376**	**73,616**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FA-24	**Facility Decontamination and Decommissioning**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL TOTAL	**389,739**	**401,265**	**544,082**	**562,524**	**624,015**	**629,186**	**614,982**	**633,058**	**665,569**	**655,168**	**637,675**	**600,934**	**636,974**	**634,445**	**603,233**
Solid Waste Facilities		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CIF Operations	23,652	26,045	27,792	32,916	34,131	35,042	34,625	34,642	35,878	34,769	36,893	35,779	35,326	36,684	39,125
	ETF Operations	16,509	17,580	21,715	19,955	19,690	20,155	20,743	23,240	22,290	23,932	24,411	26,850	24,307	26,743	26,077
	Saltstone Operations	1,489	1,222	1,778	2,795	8,135	11,643	10,561	10,846	10,482	10,765	11,055	24,419	43,796	63,130	47,391
	SW TOTAL	**41,650**	**44,847**	**51,285**	**55,666**	**61,956**	**66,840**	**65,929**	**68,729**	**68,650**	**69,465**	**72,359**	**87,049**	**103,430**	**126,558**	**112,593**
	Life Cycle Cost	**431,389**	**446,112**	**595,367**	**618,190**	**685,971**	**696,027**	**680,911**	**701,786**	**734,218**	**724,634**	**710,034**	**687,983**	**740,404**	**761,002**	**715,826**

Note: FY00 is the President's Budget which has a funding allocation based on production of 100 canisters in FY00. Since then, SRS has committed to produce 200 canisters in FY00, which will require a re-distribution of funding among the PBS's.

Appendix H.1 – Funding (Planning Case)

Budget Authority in Escalated Dollars

Project	Title	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
HL-01	**H Tank Farm**													
	H Tank Farm Operations	88,880	91,280	93,745	94,633	78,623	77,279	77,586	79,680	81,832	84,041	84,330	67,286	64,926
	LI: Replacement Evap	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-01 Total	**88,880**	**91,280**	**93,745**	**94,633**	**78,623**	**77,279**	**77,586**	**79,680**	**81,832**	**84,041**	**84,330**	**67,286**	**64,926**
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-02	**F Tank Farm**	**67,638**	**67,906**	**69,740**	**68,336**	**68,493**	**68,609**	**41,980**	**41,285**	**40,522**	**39,688**	**40,759**	**21,522**	**22,103**
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-03	**Waste Removal & Tank Closures**	-	-	-	-	-	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	17,518	17,991	18,477	18,976	19,488	10,007	10,277	10,555	10,840	5,566	5,717	5,871	6,029
	WR: Tank Closure	22	8,373	76	52,852	56,365	39,075	32,015	9,878	10,090	13,663	44,701	85,998	55,155
	HL-03 Total	**17,541**	**26,364**	**18,553**	**71,827**	**75,854**	**49,082**	**42,293**	**20,433**	**20,930**	**19,230**	**50,417**	**91,869**	**61,184**
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	**80,328**	**82,497**	**84,724**	**87,012**	**89,361**	**91,774**	**94,252**	**96,796**	**99,410**	**51,047**	**52,425**	**53,841**	**55,294**
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-05	**Vitrification**	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vitrification Ops	199,025	201,332	213,307	214,736	219,743	227,324	230,015	243,945	245,110	251,126	251,951	248,901	252,350
	Failed Equip. Stor. Vaults	-	114	2,537	2,458	-	-	161	2,917	2,759	-	-	-	-
	HL-05 Total	**199,025**	**201,446**	**215,844**	**217,194**	**219,743**	**227,324**	**230,176**	**246,862**	**247,869**	**251,126**	**251,951**	**248,901**	**252,350**
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-06	**Glass Waste Storage**	**10,434**	**1,992**	**2,046**	**2,101**	**2,158**	**2,216**	**2,276**	**2,338**	**2,401**	**2,465**	**2,532**	**1,950**	**2,003**
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-13	**Salt Disposition**													
	Salt Disposition Ops	77,494	79,586	81,841	83,724	86,544	88,651	90,690	93,381	95,778	98,876	101,414	104,287	92,550
	LI: Salt Alternative	-	-	-	47,200	64,632	49,783	-	-	-	-	-	-	-
	HL-13 Total	**77,494**	**79,586**	**81,841**	**130,923**	**151,176**	**138,434**	**90,690**	**93,381**	**95,778**	**98,876**	**101,414**	**104,287**	**92,550**
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-10	**LI: Storm Water Upgrades**	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-11	**LI: Tk Fm Services Upgrade II**	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-12	**LI: Waste Removal**	-	-	-	-	-	-	-	-	-	-	-	-	-
	LI: WR from Tanks	63,978	64,083	60,552	55,592	41,541	37,082	34,258	35,089	40,301	13,686	24,015	45,146	15,653
	LI: Vit Upgrades	13,241	13,599	-	-	-	-	-	-	-	-	-	-	-
	LI: Pipe, Evaps & Infras.	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-12 Total	**77,220**	**77,682**	**60,552**	**55,592**	**41,541**	**37,082**	**34,258**	**35,089**	**40,301**	**13,686**	**24,015**	**45,146**	**15,653**
		-	-	-	-	-	-	-	-	-	-	-	-	-
FA-24	**Facility Decontamination and Decommissioning**	-	**42,207**	**35,465**	-	-	-	-	-	-	-	**700**	**8,046**	-
		-	-	-	-	-	-	-	-	-	-	-	-	-
	HL TOTAL	**618,559**	**670,960**	**662,510**	**727,619**	**726,949**	**691,800**	**613,510**	**615,865**	**629,042**	**560,159**	**608,545**	**642,849**	**566,064**
Solid Waste Facilities		-	-	-	-	-	-	-	-	-	-	-	-	-
	CIF Operations	38,161	39,898	45,151	41,538	43,587	47,919	44,278	45,539	51,598	47,950	48,479	51,367	50,216
	ETF Operations	26,329	28,643	29,082	29,610	33,493	32,226	34,583	32,080	32,947	35,850	34,543	32,899	33,787
	Saltstone Operations	47,498	49,284	52,247	54,336	53,647	54,329	73,736	58,494	43,608	52,995	47,708	36,911	28,044
	SW TOTAL	**111,989**	**117,826**	**126,480**	**125,485**	**130,727**	**134,474**	**152,597**	**136,113**	**128,153**	**136,795**	**130,729**	**121,176**	**112,047**
	Life Cycle Cost	**730,547**	**788,785**	**788,990**	**853,104**	**857,676**	**826,274**	**766,107**	**751,978**	**757,195**	**696,954**	**739,274**	**764,026**	**678,111**

Appendix H.1 – Funding (Planning Case)

Budget Authority in Escalated Dollars

Project	Title	FY27	FY28	FY29	FY30	FY31	FY32	FY33		Cumulative FY99-End
HL-01	**H Tank Farm**									
	H Tank Farm Operations	17,342	-	-	-	-	-	-	-	2,596,217
	LI: Replacement Evap	-	-	-	-	-	-	-	-	9,418
	HL-01 Total	**17,342**	-	-	-	-	-	-	-	**2,605,635**
		-	-	-	-	-	-	-	-	-
HL-02	**F Tank Farm**	**16,265**	-	-	-	-	-	-	-	**1,593,944**
		-		-	-	-	-	-	-	-
HL-03	**Waste Removal & Tank Closures**	-	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	-	-	-	-	-	-	-	-	338,038
	WR: Tank Closure	117,830	136,185	-	-	-	-	-	-	822,759
	HL-03 Total	**117,830**	**136,185**	-	-	-	-	-	-	**1,160,798**
		-	-	-	-	-	-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	-	-	-	-	-	-	-	-	**2,007,779**
		-	-	-	-	-	-	-	-	-
HL-05	**Vitrification**	-	-	-	-	-	-	-	-	-
	Vitrification Ops	-	-	-	-	-	-	-	-	5,421,919
	Failed Equip. Stor. Vaults	-	-	-	-	-	-	-	-	22,821
	HL-05 Total	-	-	-	-	-	-	-		**5,444,740**
		-	-	-	-	-	-	-		
HL-06	**Glass Waste Storage**	-	-	-	-	-	-	-	-	**228,773**
		-	-	-	-	-	-	-	-	-
HL-13	**Salt Disposition**									
	Salt Disposition Ops	-	-	-	-	-	-	-	-	1,523,042
	LI: Salt Alternative	-	-	-	-	-	-	-	-	1,391,113
	HL-13 Total	-	-	-	-	-	-	-		**2,914,155**
		-	-	-	-	-	-	-		
HL-09	**LI: Tk Fm Services Upgrade I**	-	-	-	-	-	-	-	-	**1,590**
HL-10	**LI: Storm Water Upgrades**	-	-	-	-	-	-	-	-	**6,723**
HL-11	**LI: Tk Fm Services Upgrade II**	-	-	-	-	-	-	-	-	**21,039**
		-	-	-	-	-	-	-	-	-
HL-12	**LI: Waste Removal**	-	-	-	-	-	-	-	-	-
	LI: WR from Tanks	37,274	16,995	-	-	-	-	-	-	1,209,736
	LI: Vit Upgrades	-	-	-	-	-	-	-	-	194,877
	LI: Pipe, Evaps & Infras.	-	-	-	-	-	-	-	-	32,967
	HL-12 Total	**37,274**	**16,995**	-	-	-	-	-	-	**1,437,580**
		-	-	-	-	-	-	-	-	-
FA-24	**Facility Decontamination and Decommissioning**	**264,322**	**306,049**	-	-	-	-	-	-	**656,790**
		-	-	-	-	-	-	-	-	-
	HL TOTAL	**453,033**	**459,229**	-	-	-	-	-	-	**18,079,546**
Solid Waste Facilities		-	-	-	-	-	-	-	-	-
	CIF Operations	-	-	-	-	-	-	-	-	1,098,983
	ETF Operations	-	-	-	-	-	-	-	-	750,268
	Saltstone Operations	1,181	-	-	-	-	-	-	-	913,525
	SW TOTAL	**1,181**	-	-	-	-	-	-	-	**2,762,776**
	Life Cycle Cost	**454,214**	**459,229**	-	-	-	-	-	-	**20,842,322**

Appendix H.1 – Funding (Planning Case)

Budget Authority in Constant Dollars

Project	Title	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13
HL-01	**H Tank Farm**															
	H Tank Farm Operations	84,057	84,798	92,109	90,135	89,660	88,135	86,562	86,562	85,563	85,563	85,563	82,563	82,563	58,569	58,569
	LI: Replacement Evap	9,418	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-01 Total	**93,474**	**84,798**	**92,109**	**90,135**	**89,660**	**88,135**	**86,562**	**86,562**	**85,563**	**85,563**	**85,563**	**82,563**	**82,563**	**58,569**	**58,569**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-02	**F Tank Farm**	**57,762**	**58,626**	**60,903**	**60,141**	**59,666**	**48,144**	**46,571**	**46,571**	**46,571**	**45,571**	**45,571**	**45,571**	**44,571**	**44,571**	**44,571**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-03	**Waste Removal & Tank Closures**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	2,257	1,875	3,153	3,046	6,090	9,136	9,136	9,136	9,136	9,136	9,136	15,774	20,590	18,703	11,797
	WR: Tank Closure	636	-	-	5,404	17,859	11,916	-	4,578	5,450	2,197	9,971	8,365	27,593	28,627	-
	HL-03 Total	**2,893**	**1,875**	**3,153**	**8,451**	**23,950**	**21,051**	**9,136**	**13,714**	**14,585**	**11,332**	**19,106**	**24,139**	**48,183**	**47,330**	**11,797**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	**57,379**	**56,415**	**55,062**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-05	**Vitrification**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vitrification Ops	133,962	122,214	134,740	133,134	133,147	131,227	129,189	133,017	130,893	130,067	131,186	129,186	133,127	130,774	130,117
	Failed Equip. Stor. Vaults	-	-	2,136	1,075	9	-	38	1,561	1,552	-	-	55	1,571	1,526	-
	HL-05 Total	**133,962**	**122,214**	**136,876**	**134,209**	**133,155**	**131,227**	**129,227**	**134,578**	**132,445**	**130,067**	**131,186**	**129,242**	**134,698**	**132,300**	**130,117**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-06	**Glass Waste Storage**	**494**	**355**	**337**	**7,748**	**34,359**	**39,580**	**33,037**	**19,952**	**639**	**639**	**639**	**639**	**3,134**	**8,123**	**9,370**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-13	**Salt Disposition**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Salt Disposition Ops	13,624	40,665	34,176	-	-	-	-	-	-	-	-	26,033	51,000	51,000	51,066
	LI: Salt Alternative	-	-	72,981	110,227	109,184	108,918	111,174	113,724	138,939	132,297	86,587	33,839	-	-	-
	HL-13 Total	**13,624**	**40,665**	**107,157**	**110,227**	**109,184**	**108,918**	**111,174**	**113,724**	**138,939**	**132,297**	**86,587**	**59,871**	**51,000**	**51,000**	**51,066**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	**1,590**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-10	**LI: Storm Water Upgrades**	**2,044**	**4,276**	**232**	-	-	-	-		-	-	-	-	-	-	-
HL-11	**LI: Tk Fm Services Upgrade II**	**1,390**	**4,164**	**8,496**	**5,640**	-	-	-		-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-12	**LI: Waste Removal**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	LI: WR from Tanks	25,127	13,643	40,657	35,229	27,689	29,825	31,168	36,595	45,197	39,443	45,408	36,843	24,501	33,045	36,732
	LI: Vit Upgrades	-	289	1,073	-	11,634	11,634	11,634	11,634	11,634	8,726	13,089	8,726	13,089	13,089	13,089
	LI: Pipe, Evaps & Infras.	-	-	872	5,617	9,003	9,740	3,623	-	-	-	-	-	-	-	-
	HL-12 Total	**25,127**	**13,931**	**42,601**	**40,846**	**48,326**	**51,199**	**46,425**	**48,230**	**56,831**	**48,168**	**58,497**	**45,569**	**37,590**	**46,134**	**49,820**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FA-24	**Facility Decontamination and Decommissioning**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL TOTAL	**389,739**	**387,321**	**506,927**	**510,330**	**551,233**	**541,188**	**515,064**	**516,264**	**528,507**	**506,571**	**480,083**	**440,528**	**454,672**	**440,960**	**408,245**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Solid Waste Facilities		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CIF Operations	23,652	25,140	25,894	29,862	30,150	30,141	29,000	28,251	28,489	26,883	27,775	26,229	25,216	25,497	26,478
	ETF Operations	16,509	16,969	20,232	18,103	17,394	17,336	17,373	18,953	17,700	18,504	18,378	19,683	17,350	18,587	17,648
	Saltstone Operations	1,489	1,180	1,657	2,536	7,186	10,015	8,845	8,845	8,323	8,323	8,323	17,901	31,262	43,878	32,072
	SW TOTAL	**41,650**	**43,289**	**47,782**	**50,501**	**54,729**	**57,492**	**55,217**	**56,049**	**54,512**	**53,710**	**54,477**	**63,813**	**73,828**	**87,962**	**76,198**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Life Cycle Cost	**431,389**	**430,610**	**554,709**	**560,831**	**605,962**	**598,681**	**570,281**	**572,313**	**583,020**	**560,281**	**534,560**	**504,341**	**528,500**	**528,922**	**484,443**

Appendix H.1 – Funding (Planning Case)

Budget Authority in Constant Dollars

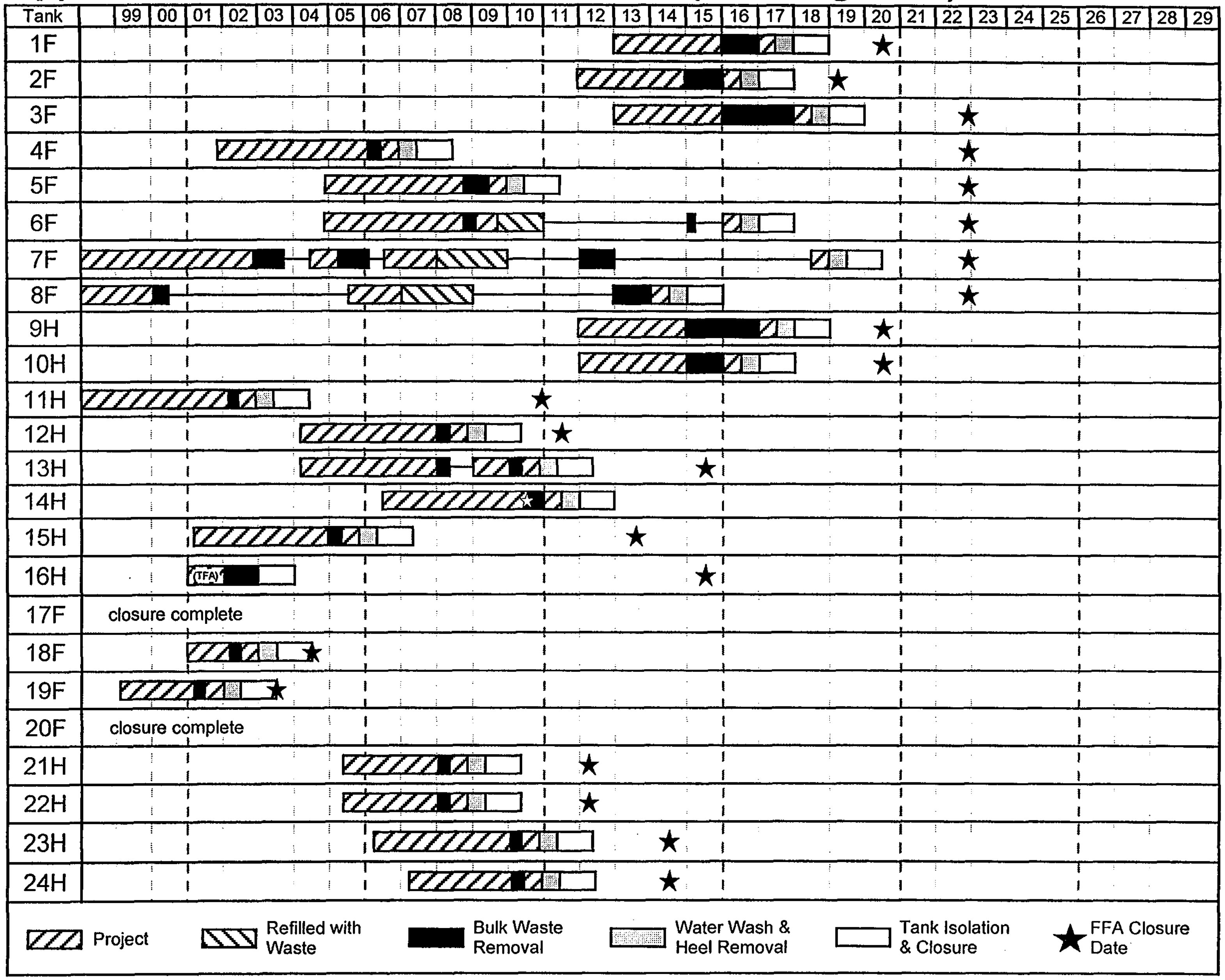
Project	Title	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
HL-01	**H Tank Farm**													
	H Tank Farm Operations	58,569	58,569	58,569	57,570	46,573	44,573	43,574	43,574	43,574	43,574	42,574	33,076	31,077
	LI: Replacement Evap	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-01 Total	**58,569**	**58,569**	**58,569**	**57,570**	**46,573**	**44,573**	**43,574**	**43,574**	**43,574**	**43,574**	**42,574**	**33,076**	**31,077**
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-02	**F Tank Farm**	**44,571**	**43,572**	**43,572**	**41,572**	**40,572**	**39,573**	**23,577**	**22,577**	**21,577**	**20,577**	**20,577**	**10,580**	**10,580**
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-03	**Waste Removal & Tank Closures**	-	-	-	-	-	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	11,544	11,544	11,544	11,544	11,544	5,772	5,772	5,772	5,772	2,886	2,886	2,886	2,886
	WR: Tank Closure	15	5,372	48	32,152	33,388	22,538	17,980	5,402	5,373	7,084	22,567	42,275	26,400
	HL-03 Total	**11,559**	**16,916**	**11,592**	**43,696**	**44,932**	**28,310**	**23,752**	**11,174**	**11,145**	**9,970**	**25,453**	**45,161**	**29,286**
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**26,467**	**26,467**	**26,467**	**26,467**
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-05	**Vitrification**	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vitrification Ops	131,151	129,184	133,269	130,635	130,166	131,117	129,181	133,403	130,515	130,204	127,197	122,354	120,788
	Failed Equip. Stor. Vaults	-	73	1,585	1,496	-	-	90	1,595	1,469	-	-	-	-
	HL-05 Total	**131,151**	**129,257**	**134,854**	**132,130**	**130,166**	**131,117**	**129,272**	**134,998**	**131,985**	**130,204**	**127,197**	**122,354**	**120,788**
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-06	**Glass Waste Storage**	**6,875**	**1,278**	**1,278**	**1,278**	**1,278**	**1,278**	**1,278**	**1,278**	**1,278**	**1,278**	**1,278**	**959**	**959**
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-13	**Salt Disposition**	-	-	-	-	-	-	-	-	-	-	-	-	-
	Salt Disposition Ops	51,066	51,066	51,132	50,933	51,265	51,132	50,933	51,066	51,000	51,265	51,199	51,265	44,299
	LI: Salt Alternative	-	-	-	28,714	38,285	28,714	-	-	-	-	-	-	-
	HL-13 Total	**51,066**	**51,066**	**51,132**	**79,647**	**89,550**	**79,846**	**50,933**	**51,066**	**51,000**	**51,265**	**51,199**	**51,265**	**44,299**
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-10	**LI: Storm Water Upgrades**	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-11	**LI: Tk Fm Services Upgrade II**	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-
HL-12	**LI: Waste Removal**	-	-	-	-	-	-	-	-	-	-	-	-	-
	LI: WR from Tanks	42,160	41,119	37,832	33,820	24,607	21,388	19,240	19,189	21,459	7,096	12,124	22,193	7,492
	LI: Vit Upgrades	8,726	8,726	-	-	-	-	-	-	-	-	-	-	-
	LI: Pipe, Evaps & Infras.	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-12 Total	**50,885**	**49,844**	**37,832**	**33,820**	**24,607**	**21,388**	**19,240**	**19,189**	**21,459**	**7,096**	**12,124**	**22,193**	**7,492**
		-	-	-	-	-	-	-	-	-	-	-	-	-
FA-24	**Facility Decontamination and Decommissioning**	-	**27,082**	**22,158**	-	-	-	-	-	-	-	**353**	**3,955**	-
		-	-	-	-	-	-	-	-	-	-	-	-	-
	HL TOTAL	**407,611**	**430,517**	**413,920**	**442,647**	**430,613**	**399,019**	**344,559**	**336,788**	**334,951**	**290,431**	**307,222**	**316,009**	**270,947**
		-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-
Solid Waste Facilities		-	-	-	-	-	-	-	-	-	-	-	-	-
	CIF Operations	25,147	25,601	28,209	25,270	25,819	27,639	24,867	24,903	27,475	24,861	24,474	25,251	24,036
	ETF Operations	17,350	18,378	18,170	18,013	19,840	18,587	19,422	17,543	17,543	18,587	17,439	16,172	16,172
	Saltstone Operations	31,300	31,623	32,643	33,055	31,778	31,336	41,412	31,988	23,220	27,477	24,085	18,144	13,423
	SW TOTAL	**73,797**	**75,602**	**79,021**	**76,339**	**77,437**	**77,562**	**85,701**	**74,434**	**68,238**	**70,925**	**65,998**	**59,567**	**53,632**
		-	-	-	-	-	-	-	-	-	-	-	-	-
	Life Cycle Cost	**481,408**	**506,120**	**492,942**	**518,986**	**508,050**	**476,581**	**430,261**	**411,223**	**403,189**	**361,356**	**373,221**	**375,576**	**324,579**

Appendix H.1 – Funding (Planning Case)

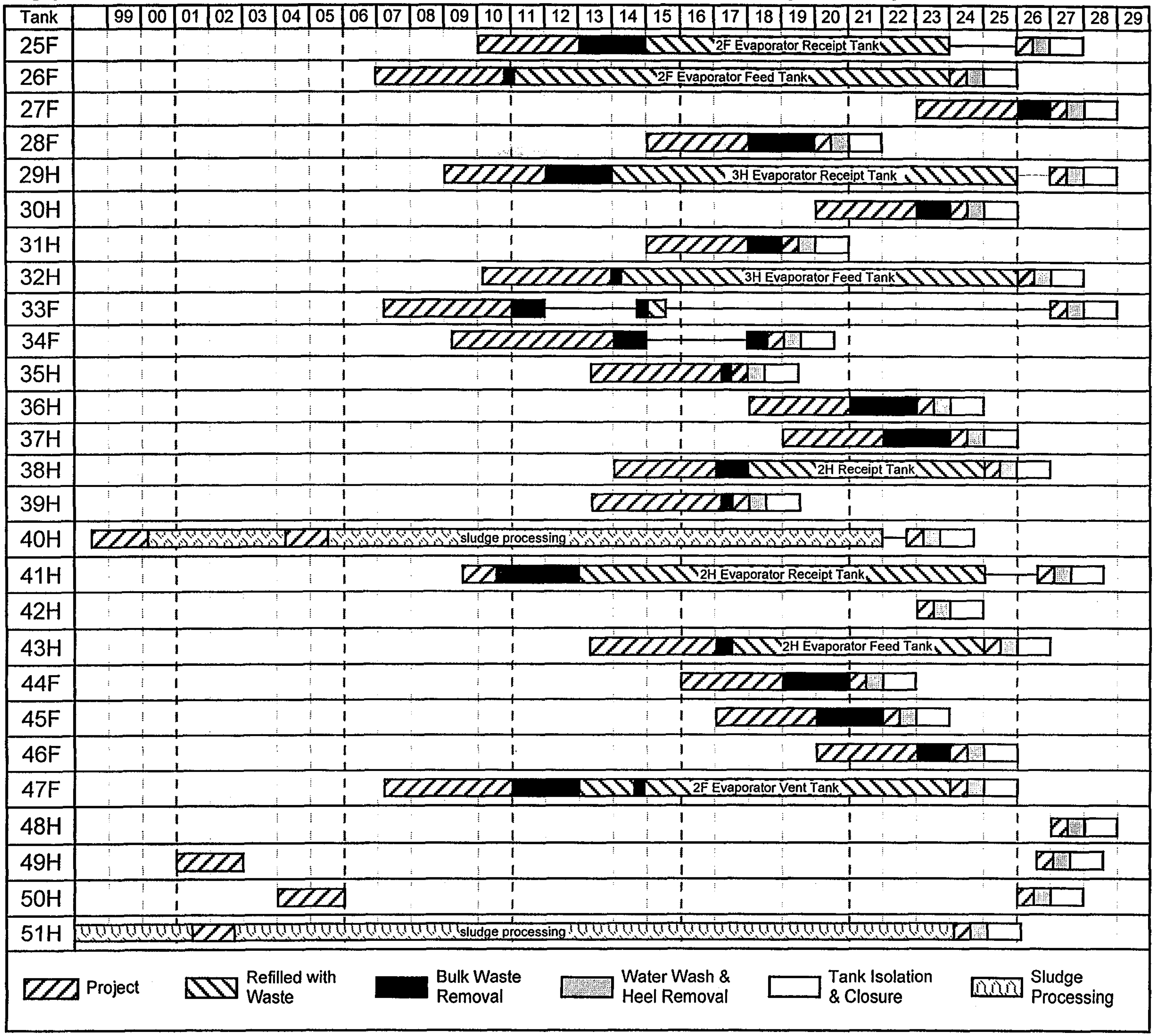
Budget Authority in Constant Dollars

Project	Title	FY27	FY28	FY29	FY30	FY31	FY32	FY33		Cumulative FY99-End
HL-01	**H Tank Farm**									
	H Tank Farm Operations	8,082	-	-	-	-	-	-	-	1,854,499
	LI: Replacement Evap	-	-	-	-	-	-	-	-	9,418
	HL-01 Total	**8,082**	-	-	-	-	-	-	-	**1,863,916**
		-	-	-	-	-	-	-	-	-
HL-02	**F Tank Farm**	**7,581**	-	-	-	-	-	-	-	**1,146,438**
		-	-	-	-	-	-	-	-	-
HL-03	**Waste Removal & Tank Closures**	-	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	-	-	-	-	-	-	-	-	230,450
	WR: Tank Closure	54,917	61,803	-	-	-	-	-	-	459,909
	HL-03 Total	**54,917**	**61,803**	-	-	-	-	-	-	**690,359**
		-	-	-	-	-	-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	-	-	-	-	-	-	-	-	**1,386,328**
		-	-	-	-	-	-	-	-	-
HL-05	**Vitrification**	-	-	-	-	-	-	-	-	-
	Vitrification Ops	-	-	-	-	-	-	-	-	3,645,142
	Failed Equip. Stor. Vaults	-	-	-	-	-	-	-	-	15,833
	HL-05 Total	-	-	-	-	-	-	-	-	**3,660,975**
		-	-	-	-	-	-	-	-	-
HL-06	**Glass Waste Storage**	-	-	-	-	-	-	-	-	**180,620**
		-	-	-	-	-	-	-	-	-
HL-13	**Salt Disposition**	-	-	-	-	-	-	-	-	-
	Salt Disposition Ops	-	-	-	-	-	-	-	-	925,184
	LI: Salt Alternative	-	-	-	-	-	-	-	-	1,113,583
	HL-13 Total	-	-	-	-	-	-	-	-	**2,038,766**
		-	-	-	-	-	-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	-	-	-	-	-	-	-	-	**1,590**
HL-10	**LI: Storm Water Upgrades**	-	-	-	-	-	-	-	-	**6,553**
HL-11	**LI: Tk Fm Services Upgrade II**	-	-	-	-	-	-	-	-	**19,690**
		-	-	-	-	-	-	-	-	-
HL-12	**LI: Waste Removal**	-	-	-	-	-	-	-	-	-
	LI: WR from Tanks	17,372	7,713	-	-	-	-	-	-	835,906
	LI: Vit Upgrades	-	-	-	-	-	-	-	-	146,790
	LI: Pipe, Evaps & Infras.	-	-	-	-	-	-	-	-	28,854
	HL-12 Total	**17,372**	**7,713**	-	-	-	-	-	-	**1,011,550**
		-	-	-	-	-	-	-	-	-
FA-24	**Facility Decontamination and Decommissioning**	**123,192**	**138,890**	-	-	-	-	-	-	**315,630**
		-	-	-	-	-	-	-	-	-
	HL TOTAL	**211,144**	**208,405**	-	-	-	-	-	-	**12,322,415**
		-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
Solid Waste Facilities		-	-	-	-	-	-	-	-	-
	CIF Operations	-	-	-	-	-	-	-	-	742,210
	ETF Operations	-	-	-	-	-	-	-	-	503,937
	Saltstone Operations	550	-	-	-	-	-	-	-	563,868
	SW TOTAL	**550**	-	-	-	-	-	-	-	**1,810,016**
		-	-	-	-	-	-	-	-	-
	Life Cycle Cost	**211,695**	**208,405**	-	-	-	-	-	-	**14,132,431**

Appendix H.2 Waste Removal Schedule (Planning Case)



Appendix H.2 Waste Removal Schedule (Planning Case)



Appendix H.3 - Tank Farm Material Balance (Planning Case)

End of Mo/Yr	Influents (gal) F Canyon LHW	F Canyon HHW	H Canyon LHW	H Canyon HHW	DWPF Recycle Sludge	DWPF Recycle Salt	ESP WW	Tank WW	Other	Backlog Tk	Backlog Volume (gal)	SGF	Ev	Type I & III Tanks Reused (kgal) Tk	Volume	Effluents (gal) 2F Evap	2H Evap	RHLWE	Salt Proc.	Other	Usable Space (gal)	Notes
Jan-99																					1,769,318	Actual inventory (Ref. Date Jan 22)
Feb-99	17,500	1,800	30,000		186,369				37,667	26,32,43	200,000	0.40	2F/2H			75,003	245,399				1,816,384	
Mar-99	27,500	1,800	40,000		186,369				37,667	26,32,43	200,000	0.40	2F/2H			82,103	252,499				1,857,650	
Apr-99	45,500	1,800	45,000		186,369				37,667	26,32,43	200,000	0.40	2F/2H			94,883	256,049				1,892,246	
May-99	27,500	1,800	30,000		186,369				37,667	26,32,43	200,000	0.40	2F/2H			82,103	245,399				1,936,412	
Jun-99	10,500	1,800	30,000		186,369				37,667	26,32,43	190,000	0.40	2F/2H			65,033	245,399				1,980,509	
Jul-99	27,500	1,800	30,000		186,369				37,667	43	100,000	0.30	2H			32,103	245,399				1,974,675	
Aug-99	10,500	1,800	30,000		186,369				37,667	33,35,38	512,000	0.62	2F/2H			277,053	276,899				2,262,291	
Sep-99	27,500	1,800	16,000		186,369				37,667	35	200,000	0.64	2F			160,103	205,459			(21,240)	2,337,277	Tank 22 fed to 2H Evaporator
FY99	194,000	14,400	251,000		1,490,952				301,333		1,802,000					868,384	1,972,500			(21,240)		
Oct-99	10,500	1,800	36,000		163,374				37,667	35	200,000	0.64	2F			148,033	162,204	36,759			2,434,932	
Nov-99	27,500	1,800	30,000		163,374				37,667	35	100,000	0.64	2F			96,103	157,944	36,759			2,465,398	
Dec-99	10,500	1,800	30,000		163,374				37,667	30	200,000	0.30	RE			20,033	157,944	96,759			2,496,794	
Jan-00	27,500	1,800	30,000		163,374				37,667	30	200,000	0.30	RE			32,103	157,944	96,759			2,523,259	
Feb-00	10,500	1,800	30,000		163,374				37,667	30	200,000	0.30	RE			20,033	157,944	96,759			2,554,655	Xfer 1051 Kgal Tk40 to Tk42
Mar-00	27,500	1,800	30,000		163,374				37,667	30&39	400,000	0.44	RE			32,103	157,944	212,759		(1,098,000)	1,599,120	Tk 40 to ESP service
Apr-00	10,500	1,800	30,000		163,374				37,667	30&39	400,000	0.44	RE			20,033	157,944	212,759			1,746,516	
May-00	27,500	1,800	30,000		163,374				37,667	39	200,000	0.57	RE			32,103	157,944	150,759			1,826,982	
Jun-00	10,500	1,800	30,000		163,374				37,667	39	200,000	0.57	RE			20,033	157,944	150,759			1,912,377	
Jul-00	27,500	1,800	30,000		163,374		390,000		37,667	39	100,000	0.57	RE			151,443	157,944	305,919			1,877,343	
Aug-00	10,500	1,800	30,000		163,374				37,667							20,033	157,944	36,759			1,848,738	
Sep-00	27,500	1,800	30,000		163,374		338,000		37,667							135,531	157,944	220,631			1,764,504	
FY00	228,000	21,600	366,000		1,960,488		728,000		452,000		2,200,000					727,584	1,899,589	1,654,142		(1,098,000)		
Oct-00	10,500	1,800	50,000		163,374				37,667	42	200,000	0.37	RE			20,033	135,385	147,518			1,804,100	Tank 42 Backlog from Tank 40
Nov-00	27,500	1,800	30,000		163,374		338,000		37,667	42	200,000	0.37	RE			135,531	121,185	331,390			1,793,865	
Dec-00	10,500	1,800	30,000		163,374		338,000		37,667	42	200,000	0.37	RE			123,461	121,185	331,390			1,788,561	
Jan-01	27,500	1,800	30,000		163,374				37,667	42	200,000	0.37	RE			32,103	121,185	147,518			1,829,026	
Feb-01	10,500	1,800	30,000		163,374		338,000		37,667	42	200,000	0.37	RE			123,461	121,185	331,390			1,823,722	
Mar-01	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518			1,790,188	
Apr-01	10,500	1,800	30,000		163,374		338,000		37,667							123,461	121,185	257,390			1,710,883	
May-01	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518			1,677,349	
Jun-01	10,500	1,800	30,000		163,374				37,667							20,033	121,185	73,518			1,648,744	
Jul-01	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518			1,615,210	
Aug-01	10,500	1,800	30,000		163,374				37,667							20,033	121,185	73,518			1,586,606	
Sep-01	27,500	1,800	16,000		163,374				37,667							32,103	111,245	73,518			1,557,131	
FY01	228,000	21,600	366,000		1,960,488		1,352,000		452,000		1,000,000					726,528	1,458,480	1,987,708				

Appendix H.3 - Tank Farm Material Balance (Planning Case)

End of Mo/Yr	Influents (gal) F Canyon LHW	F Canyon HHW	H Canyon LHW	H Canyon HHW	DWPF Recycle Sludge	DWPF Recycle Salt	ESP WW	Tank WW	Other	Backlog Tk	Backlog Volume (gal)	SGF	Ev	Type I & III Tanks Reused (kgal) Tk	Volume	Effluents (gal) 2F Evap	2H Evap	RHLWE	Salt Proc.	Other	Usable Space (gal)	Notes
Oct-01	10,500	1,800	50,000		163,374				37,667							20,033	135,385	73,518			1,522,727	
Nov-01	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518			1,489,192	
Dec-01	10,500	1,800	30,000		163,374				37,667							20,033	121,185	73,518			1,460,588	
Jan-02	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518			1,427,054	
Feb-02	10,500	1,800	30,000		163,374				37,667							20,033	121,185	73,518		(68,950)	1,329,499	Tank 11 Supernate fed to Evap
Mar-02	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518		(73,990)	1,221,975	Tank 7 Supernate fed to Evap
Apr-02	10,500	1,800	30,000		163,374			140,000	37,667							74,319	121,185	152,233			1,186,370	
May-02	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518			1,152,836	
Jun-02	10,500	1,800	30,000		163,374		280,000		37,667							105,713	121,185	225,838			1,082,232	
Jul-02	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518			1,048,697	
Aug-02	10,500	1,800	30,000		163,374				37,667							20,033	121,185	73,518			1,020,093	
Sep-02	27,500	1,800	16,000		163,374				37,667							32,103	111,245	73,518			990,618	
FY02	228,000	21,600	366,000		1,960,488		280,000	140,000	452,000							452,782	1,458,480	1,113,254		(142,940)		
FY03	135,000	3,600	56,000		1,960,488		1,374,000	330,000	452,000					49	100	782,409	1,238,380	1,815,216		1,271,000	1,786,536	Tk 49 Ready for Storage by FY03
FY04	120,000		56,000		1,960,488		774,000		452,000					49	350	457,644	1,238,380	1,303,276			1,423,347	
FY05	120,000		56,000		1,960,488		800,000		452,000					49	820	465,600	1,238,380	1,317,420		(228,100)	828,158	Tk 4,7,18,19 Supernate fed to Evap
FY06	120,000		56,000		1,960,488		1,676,000	190,000	452,000					50	300	807,329	1,238,380	1,900,790		1,271,000	1,591,169	Tk 50 Ready for Storage by FY06
FY07	120,000		56,000		1,960,488		1,196,000	140,000	452,000					50 / 8	968 /100	641,062	1,238,380	1,611,558		(168,000)	989,680	Tk 13 Sup. xfr to 50, 8 Ready for Storage
FY08	120,000		56,000		1,960,488		430,000		297,000					8 / 7	400 /100	305,880	1,129,880	1,116,140		500,000	1,178,092	Tank 7 Ready for Storage
FY09	120,000		56,000		1,960,488		2,068,000	470,000	297,000					7 / 6	350 /500	861,394	1,129,880	2,271,467		500,000	969,344	Tank 6 Ready for Storage
FY10	120,000		56,000		1,960,488	160,000	944,000	140,000	297,000							719,082	1,201,880	1,546,470	1,212,000		1,971,287	Start Salt Processing 4/10
FY11					1,960,488	320,000	1,579,000	660,000	297,000							828,192	1,234,120	2,256,277	2,873,000		4,346,389	
FY12					1,960,488	320,000	2,051,000	50,000	297,000							736,094	1,234,120	2,170,076	2,073,000		5,881,190	
FY13					1,960,488	320,000			297,000							89,100	1,234,120	1,026,220	2,154,000		7,807,141	
FY14					1,960,488	320,000	800,000	140,000	297,000							388,186	1,234,120	1,540,134	2,326,000	(500,000)	9,278,092	Tank 6 material moved to Tank 33
FY15					1,960,488	320,000	1,648,000	140,000	297,000							647,674	1,234,120	2,001,446	883,000		9,678,843	
FY16					1,960,488	320,000	1,872,000	330,000	297,000							789,891	1,234,120	2,230,128	1,082,000		10,235,495	
FY17					1,960,488	320,000	250,000	380,000	297,000							312,947	1,234,120	1,375,873	1,893,000		11,843,946	
FY18					1,960,488	320,000	1,450,000	420,000	297,000							695,657	1,234,120	2,051,162	1,957,000		13,334,397	
FY19					1,960,488	320,000	600,000	420,000	297,000							435,557	1,234,120	1,588,762	2,087,000		Start Closing	
FY20					1,960,488	320,000	110,000	420,000	297,000							285,617	1,234,120	1,322,202	1,889,000		Type III Tanks	
FY21					1,960,488	320,000	680,000	420,000	297,000							460,037	1,234,120	1,632,282	2,025,000			
FY22					1,960,488	320,000		140,000	297,000							143,386	1,234,120	1,104,934	2,553,000			
FY23					1,960,488	320,000		420,000	297,000							251,957	1,234,120	1,262,362	2,160,000			
FY24					1,960,488	320,000		560,000	297,000							306,243	1,234,120	1,341,077	1,864,000			2F shuts down end of FY24
FY25					1,960,488	320,000			297,000								1,234,120	1,115,320	1,926,000			2H shuts down end of FY25
FY26					1,622,681	264,862		560,000	297,000									2,527,788	1,354,000			RHLWE shuts down end of program
FY27								700,000										665,000				

Appendix H.4 - Salt Solution Processing (Planning Case)

SALT SOLUTION PROCESSING FACILITY									SALTSTONE FACILITY				
Fiscal Year	FY Start Date	Source Tank	Waste Removed (Kgal)	Feed Type	Salt Feed to Salt Processing (Kgal)	NaTPB Req'd (Kgal)	10 wt% ppt Feed to DWPF (Kgal)	Ppt Cs Conc (Ci/gal)	Salt Processing Filtrate to Grout (Kgal)	ETF Feed to Grout (Kgal)	Grout Produced (Kgal)	Cum Vault Cells Filled	Active Grout Vault #'s
FY10	10/1/09	14	153	ds	413	99	163	34.3	3,963	90	7,174	9.61	4
		30	400	cs	400								
		33	127	cs	127								
		38	100	cs	100								
		41	16	cs	16								
		41	269	ds	725								
		46	190	cs	190								
		47	110	cs	110								
				dw	562								
	Type III Tank space gain		1,212	total	2,643								
FY11	10/1/10	25	50	cs	50	197	325	40.6	7,362	180	13,349	16.97	4, 1 and 2
		29	217	cs	217								
		32	621	cs	621								
		33	222	ds	600								
		38	150	cs	150								
		41	148	ds	400								
		43	394	cs	394								
		46	330	cs	330								
		47	741	ds	2,000								
				dw	402								
	Type III Tank space gain		2,873	total	5,164								
FY12	10/1/11	7	450	cs	450	197	325	27.5	7,323	180	13,280	24.29	2 and 3
		25	50	cs	50								
		29	74	ds	200								
		30	150	cs	150								
		34	500	cs	500								
		35	100	cs	100								
		38	300	cs	300								
		41	789	ds	2,131								
		47	110	ds	297								
				dw	957								
	Type III Tank space gain		2,073	total	5,135								
FY13	10/1/12	8	500	cs	500	198	326	33.9	7,322	180	13,279	31.61	3 and 5
		25	63	cs	63								
		25	185	ds	500								
		29	906	ds	2,446								
		30	130	cs	130								
		34	420	cs	420								
		35	200	cs	200								
		38	150	cs	150								
		46	100	cs	100								
				dw	626								
	Type III Tank space gain		2,154	total	5,135								

Appendix H.4 - Salt Solution Processing (Planning Case)

SALT SOLUTION PROCESSING FACILITY									SALTSTONE FACILITY				
Fiscal Year	FY Start Date	Source Tank	Waste Removed (Kgal)	Feed Type	Salt Feed to Salt Processing (Kgal)	NaTPB Req'd (Kgal)	10 wt% ppt Feed to DWPF (Kgal)	Ppt Cs Conc (Ci/gal)	Salt Processing Filtrate to Grout (Kgal)	ETF Feed to Grout (Kgal)	Grout Produced (Kgal)	Cum Vault Cells Filled	Active Grout Vault #'s
FY14	10/1/13	25	900	ds	2,431	198	326	42.3	7,343	180	13,316	38.96	5, 6 and 7
		27	50	cs	50								
		34	208	ds	561								
		35	500	cs	500								
		38	88	cs	88								
		39	350	cs	350								
		46	230	cs	230								
				dw	946								
Type III Tank space gain			2,326	total	5,156								
FY15	10/1/14	2	525	ds	1,418	198	326	35.7	7,187	180	13,040	46.14	7 and 8
		9	389	ds	1,050								
		10	209	ds	563								
		27	50	cs	50								
		30	100	cs	100								
		35	433	cs	433								
		39	300	cs	300								
				dw	1,126								
Type III Tank space gain			883	total	5,040								
FY16	10/1/15	1	19	cs	19	199	327	42.5	6,616	180	12,029	52.77	8 and 9
		1	470	ds	1,270								
		3	278	ds	750								
		9	138	ds	373								
		38	311	cs	311								
		39	521	cs	521								
		46	250	cs	250								
				dw	1,128								
Type III Tank space gain			1,082	total	4,622								
FY17	10/1/16	3	247	ds	668	196	323	36.5	6,921	180	12,569	59.70	9 and 10
		28	186	cs	186								
		30	150	cs	150								
		31	248	cs	248								
		38	853	ds	2,302								
		42	200	cs	200								
		43	56	cs	56								
		46	200	cs	200								
				dw	832								
Type III Tank space gain			1,893	total	4,842								

Appendix H.4 - Salt Solution Processing (Planning Case)

SALT SOLUTION PROCESSING FACILITY									SALTSTONE FACILITY				
Fiscal Year	FY Start Date	Source Tank	Waste Removed (Kgal)	Feed Type	Salt Feed to Salt Processing (Kgal)	NaTPB Req'd (Kgal)	10 wt% ppt Feed to DWPF (Kgal)	Ppt Cs Conc (Ci/gal)	Salt Processing Filtrate to Grout (Kgal)	ETF Feed to Grout (Kgal)	Grout Produced (Kgal)	Cum Vault Cells Filled	Active Grout Vault #'s
FY18	10/1/17	28	185	ds	500	201	330	29.6	6,819	180	12,388	66.53	10 and 11
		31	994	ds	2,683								
		42	200	cs	200								
		44	278	cs	278								
		46	200	cs	200								
		49	100	cs	100								
				dw	859								
	Type III Tank space gain		1,957	total	4,820								
FY19	10/1/18	28	826	ds	2,231	199	326	23.2	6,693	180	12,165	73.24	11 and 12
		30	250	cs	250								
		42	200	cs	200								
		44	333	ds	900								
		45	137	cs	137								
		46	190	cs	190								
		49	150	cs	150								
				dw	621								
	Type III Tank space gain		2,087	total	4,679								
FY20	10/1/19	27	80	cs	80	196	322	36.3	6,272	180	11,420	79.53	12 and 13
		30	100	cs	100								
		36	155	cs	155								
		42	200	cs	200								
		44	636	ds	1,717								
		45	519	ds	1,400								
		46	200	cs	200								
				dw	551								
	Type III Tank space gain		1,889	total	4,403								
FY21	10/1/20	27	100	cs	100	198	325	45.6	6,602	180	12,004	86.15	13, 14 and 15
		36	519	ds	1,400								
		29	150	cs	150								
		37	268	cs	268								
		42	200	cs	200								
		45	589	ds	1,590								
		49	200	cs	200								
				dw	784								
	Type III Tank space gain		2,025	total	4,692								
FY22	10/1/21	29	600	cs	600	197	325	35.5	7,058	180	12,811	93.21	15 and 16
		36	554	ds	1,495								
		37	370	ds	1,000								
		42	236	cs	236								
		46	393	cs	393								
		49	400	cs	400								
				dw	1,111								
	Type III Tank space gain		2,553	total	5,235								

Appendix H.4 - Salt Solution Processing (Planning Case)

SALT SOLUTION PROCESSING FACILITY									SALTSTONE FACILITY				
Fiscal Year	FY Start Date	Source Tank	Waste Removed (Kgal)	Feed Type	Salt Feed to Salt Processing (Kgal)	NaTPB Req'd (Kgal)	10 wt% ppt Feed to DWPF (Kgal)	Ppt Cs Conc (Ci/gal)	Salt Processing Filtrate to Grout (Kgal)	ETF Feed to Grout (Kgal)	Grout Produced (Kgal)	Cum Vault Cells Filled	Active Grout Vault #'s
FY23	10/1/22	27	170	cs	170	201	330	29.3	6,007	180	10,951	99.25	16 and 17
		30	607	cs	607								
		30	65	ds	175								
		37	583	ds	1,575								
		46	264	ds	714								
		49	170	cs	170								
		50	300	cs	300								
				dw	759								
	Type III Tank space gain		2,160	total	4,470								
FY24	10/1/23	27	200	cs	200	200	325	24.4	3,596	180	6,684	102.94	17
		29	450	cs	450								
		41	500	cs	500								
		49	264	cs	250								
		50	450	cs	450								
				dw	861								
	Type III Tank space gain		1,864	total	2,711								
FY25	10/1/24	25	294	cs	294	201	327	25.4	3,588	180	6,669	106.61	17 and 18
		27	158	cs	158								
		29	400	cs	400								
		33	100	cs	100								
		41	456	cs	456								
		50	518	cs	518								
				dw	779								
	Type III Tank space gain		1,926	total	2,705								
FY26	10/1/25	27	454	ds	1,225	96	269	35.9	3,360	180	6,266	110.07	18 and 19
		29	500	cs	500								
		33	400	cs	400								
				dw	368								
	Type III Tank space gain		1,354	total	2,493								

Notes:
* Space gain refers to Type III tanks only and is equal to cs + ds (prior to dissolution)
* Tank 33 material is refilled with concentrated supernate in FY14 to support Tank 6 closure.
* cs = concentrated supernate
* ds = dissolved salt cake
* dw = dilution water to bring salt feed to 6.44 [Na+] for feed to Salt Processing, additional dilution to 4.7 [Na+] is performed at the Salt Processing Facility.
* NaTPB = sodium tetraphenylborate
* Precipitate Cesium Ci/gal has not been adjusted for decay
* With a permanent roof, each cell measures 98.5 x 98.5 x 25 feet = 242,500 cu ft, and holds 1,814 kgal grout, or 1,025 kgal feed.
* Existing Vault #1 has 6 cells, of which 3 are already filled. Vault #4 has 12 cells, of which 1 is already filled. All new vaults will have six cells each.
* Vault # fill sequence is assumed to be 4, 1, 2, 3, 5, 6, 7, ... etc.

Appendix H.5 - Sludge Processing (Planning Case)

	Waste Removal		ESP Pretreatment									DWPF Vitrification						
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
Sludge Batch	Source Tanks	Sludge Content (kg)	Alum. Rem'd (wt %)*	Alum. Dis. Start Date	Wash Start Date	Feed Prep Total Dur. (months)	Total ESP Water Vol. (kgal)	Na (wt% dry)*	Hg (wt% dry)*	Total Solids (wt%)*	Pretreated Volume (kgal)*	Feed Volume (kgal)	Start Feed	Canister Yield*	Feed Duration (years)	Finish Feed	Feed Tank	Waste Loading (wt %)*
1A	51	na	na	na	na	na	na	8.80		16.4	491	491	3/1/96	492	2.75	8/30/98	51	25.0
												-140	(Tk 51 heel @ 40 ")					
												351						
1B	42	420,861	na	na	na	na	na	7.77		16.5	460	460	10/1/98	600	2.75	6/30/01	51	25.0
	total	420,861											(Tk 51 heel @ 40 ")					
2	8	182,500	na	na	7/30/00	12	2,080	6.90		16.9	582	582	6/30/01	575	2.88	5/15/04	40	25.0
	40	167,100										-140	(Tk 40 heel @ 40 ")					
	total	349,600										442						
3	7 (70%)	288,960			4/15/03	23	2,590	6.90		16.5	670	670	5/15/04	622	3.11	6/24/07	51	28.8
	11	124,400	75	7/15/02														
	total	413,360																
4	4	65,480			2/22/06	27	3,670	8.90		16.5	651	651	6/24/07	555	2.77	4/1/10	40	29.8
	7 (30%)	123,840																
	15	165,800	50	4/24/05														
	18	20,740																
	19	2,794																
	total	378,654																
5	5	57,630			3/2/09	24	3,080	6.90		16.5	685	685	4/1/10	523	2.62	11/11/12	51	30.8
	6	38,710																
	13 (30%)	125,280	50	5/1/08														
	12	189,700	50															
	21	6,393																
	22	13,260																
	total	430,973																
6	13 (70%)	292,320	35	5/13/10	3/13/11	31	4,090	7.02		16.5	881	881	11/11/12	779	3.89	10/3/16	40	27.8
	23	59,110																
	26	154,900																
	total	506,330																
7	47	137,800			2/2/15	31	4,320	6.93	3.00	16.5	606	606	10/3/16	498	2.49	3/30/19	51	31.3
	32	195,600	86	4/4/14														
	33	62,400																
	total	395,800																
8	34	77,120			4/30/18	22	2,300	6.84	3.72	16.5	680	680	3/30/19	492	2.46	9/12/21	40	32.2
	35	139,000	61	6/29/17								140	(pump down Tk 40 heel to 0)					
	39	89,470	61									820						
	43	51,940																
	40 heel	72,000																
	total	429,530																

Appendix H.5 - Sludge Processing (Planning Case)

	Waste Removal		ESP Pretreatment										DWPF Vitrification						
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
Sludge Batch	Source Tanks	Sludge Content (kg)	Alum. Rem'd (wt %)*	Alum. Dis. Start Date	Wash Start Date	Feed Prep Total Dur. (months)	Total ESP Water Vol. (kgal)	Na (wt% dry)*	Hg (wt% dry)*	Total Solids (wt%)*	Pretreated Volume (kgal)*	Feed Volume (kgal)	Start Feed	Canister Yield*	Feed Duration (years)	Finish Feed	Feed Tank	Waste Loading (wt %)*
9	51 heel	72,562			1/12/21	19	790	6.95	1.52	16.5	442	442	9/12/21	438	2.19	11/21/23	51	30.3
	1-3,9-10,36,41	20,316																
	42 heel	31,042	48	3/14/20														
	Type III's	187,871	48															
	total	311,791																
Totals							22,920					6,008		5,573	28			

Notes:

* General: As described in the text of the plan, several Source Tank changes have been made from Rev. 9 of the HLW System Plan due to the delay in Salt Processing. Insufficient time was available to run the CPES and PCCS models to fully assess the impact on the sludge batches from these Source Tank changes. It is expected that all changes can be accommodated with no significant impact on canister yields as shown above. Prior to the next revision of the HLW System Plan, all sludge batches will be run through the CPES and PCCS models for verification. For this revision of the plan, the numbers indicated with an * are the same as shown in Rev. 9 unless otherwise noted.

A) Each Sludge Batch must be individually tested and confirmed to meet waste qualification spedicfications

B) Sludge in these tanks will comprise the batch. Note: The sludge from Tanks 18&19 is now shown in Batch 4, however these tanks will be cleaned out earlier, with the sludge moved to Tk 7, to support FFA dates.

C) Amount of sludge from each source tank in the batch obtained from WCS data base

D) Amount of aluminum removed from HM sludge (typically H-Area HHW sludge) per CPES model

E) Aluminum dissolution start date for H-Area sludge in batch. Note: H-Area sludge must be in ESP tank 1 mo. prior to this date to allow for settling and decant of transfer water.

F) Start date of water washing of combined H- & F-Area sludge to obtain proper alkali composition of the sludge slurry. Note: F-Area sludge must be in ESP tank 1 mo. prior to this date.

G) Total planned duration of aluminum dissolution, washing, sampling, test glass production, and associated decants

H) Total volume of sludge transfer water, aluminum dissolution and wash water decants

I) Amount of total Na in washed sludge (dry basis)

J) Amount of total Hg in washed sludge (dry basis)

K) Total solids (soluble and insoluble) in washed sludge, normally adjusted to 16.5 wt%

L) Volume of sludge at given wt% total solids before heel effects (Batch 1B is actual. Batch 2 and beyond are based on ratio of Rev. 9 numbers with sludge kg values for new batch makeups)

M) Volume of sludge available for feed after adding or subtracting pump heel

N) Start feed date based on depletion of previous batch down to pump heel

O) Estimated number of canisters produced given the pretreatment as shown. Numbers have been adjusted from Rev. 9 based on Batch 1A operating data and feed availabilty changes as described in the text of this plan. Total shown at the bottom does not include Salt Only cans made in the last years of the program.

P) Column O divided by the planned canister production during the period in which the batch is vitrified

Q) Column N plus column P. Finish Feed means when the last transfer of feed is sent from the Feed Tank. The last canister for the batch will be poured later. The DWPF has approximately 25 canisters of feed in process. Therefore 25 more canisters will be produced from the batch after the last feed is sent to DWPF.

R) Batch feed tank

S) Weight % of glass comprised of sludge oxides. Numbers have been adjusted from Rev. 9 for Batch 1B and 2 based on Batch 1A operating data.

Appendix H.6 - Canister Storage (Planning Case)

End of Year	SRS Cans Produced		SRS Cans In GWSB #1 (2,159 max)			SRS Cans In GWSB #2 2,286 -311 = 1975			SRS Cans Shipped to Repository		Net Cans Stored At SRS
	Yearly	Cum.	Added	Shipped	Cum.	Added	Shipped	Cum.	Each Year	Cumulative	
1996	64	64	64		64						64
1997	169	233	169		233						233
1998	250	483	250		483						483
1999	250	733	250		733						733
2000	200	933	200		933						933
2001	200	1,133	200		1,133						1,133
2002	200	1,333	200		1,333						1,333
2003	200	1,533	200		1,533						1,533
2004	200	1,733	200		1,733						1,733
2005	200	1,933	200		1,933	0		0			1,933
2006	200	2,133	200		2,133	0		0			2,133
2007	200	2,333	26		2,159	174		174			2,333
2008	200	2,533			2,159	200		374			2,533
2009	200	2,733			2,159	200		574			2,733
2010	200	2,933			2,159	200		774			2,933
2011	200	3,133			2,159	200		974			3,133
2012	200	3,333			2,159	200		1,174			3,333
2013	200	3,533			2,159	200		1,374			3,533
2014	200	3,733			2,159	200		1,574			3,733
2015	200	3,933		(500)	1,659	200	0	1,774	500	500	3,433
2016	200	4,133		(500)	1,159	200	0	1,974	500	1,000	3,133
2017	200	4,333	200		1,359		(500)	1,474	500	1,500	2,833
2018	200	4,533	200	0	1,559	0	(500)	974	500	2,000	2,533
2019	200	4,733	0	(500)	1,059	200	0	1,174	500	2,500	2,233
2020	200	4,933		(500)	559	200	0	1,374	500	3,000	1,933
2021	200	5,133		(500)	59	200	0	1,574	500	3,500	1,633
2022	200	5,333	200	0	259		(500)	1,074	500	4,000	1,333
2023	200	5,533	200		459		(500)	574	500	4,500	1,033
2024	89	5,622	0	(459)	0	89	(41)	622	500	5,000	622
2025	60	5,682		0	0	60	(500)	182	500	5,500	182
2026	50	5,732		0	0	50	(232)	0	232	5,732	0
2027	0	5,732		0	0	0	0	0	0	5,732	0
2028											
2029											

Appendix H.6 - Canister Storage (Planning Case)

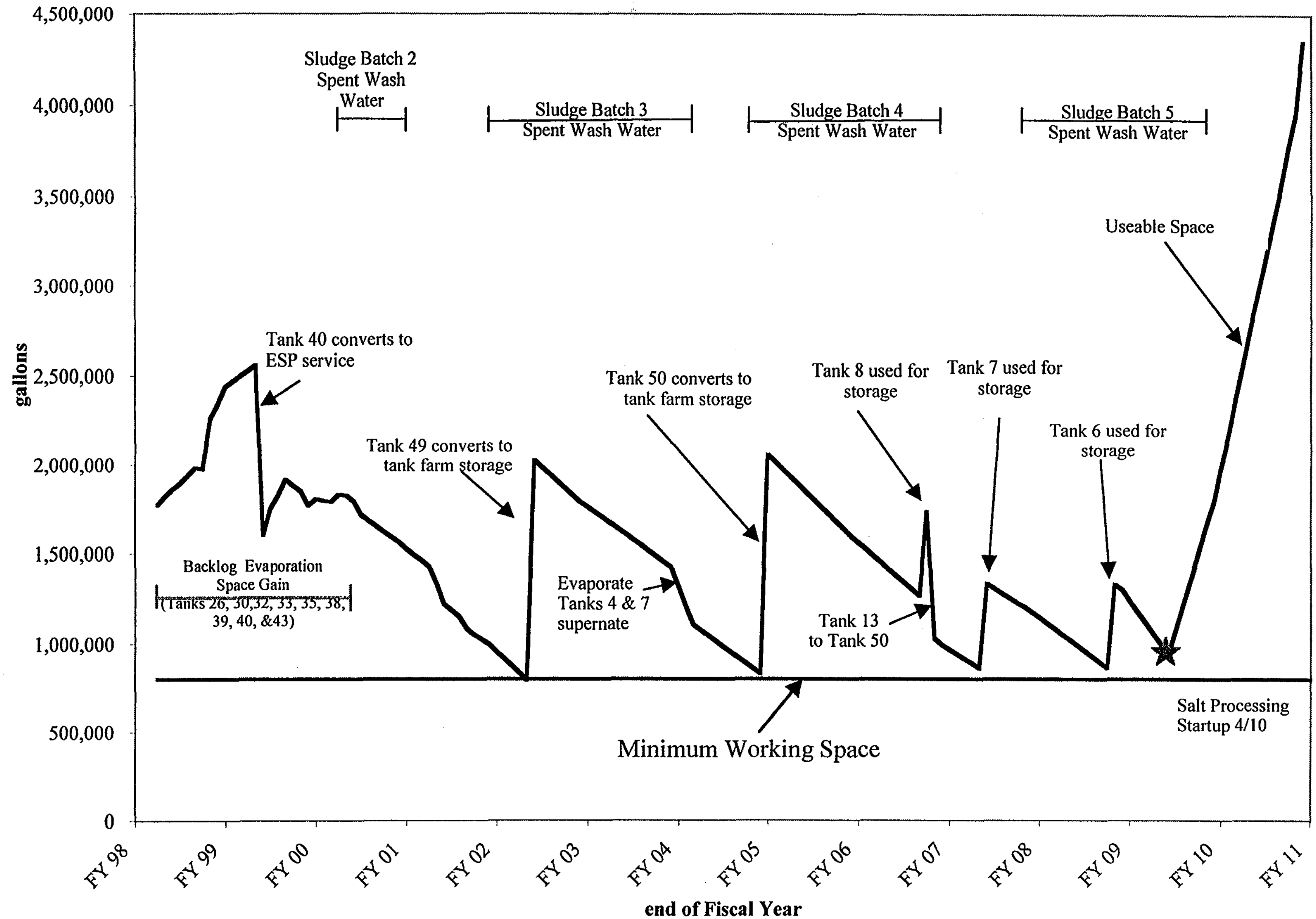
Notes:

1) GWSB #1 filling began in April 1996. It has 2,286 canister storage locations, less 122 locations for which the plugs cannot be repaired, less 5 positions being used for storage of non-radioactive test canisters = 2,159 usable storage locations. However, of the 2,159 usable positions, 450 locations are currently abandoned in place and will need repair/replacement plugs before they will be available for use.
2) GWSB#1 is expected to reach maximum capacity in FY07. Therefore, GWSB#2 must be ready to start operations in FY07.
3) GWSB#2 is sized to provide storage if the Canister shipment date is delayed by up to 2 years.
4) This System Plan assumes that canisters can be transported to the Federal Repository at a rate of 500 per year, starting in 2015.
5) A canister load-out facility will be required to move the canisters from the GWSB's to a truck or railcar. Assume one year for design (FY12) and two years for construction (FY13-14).
6) GWSB#1 will be emptied and available for D&D in FY24.
7) GWSB#2 will be emptied and available for D&D in FY26.
8) This System Plan does not include possible can-in-can disposition of excess plutonium.
9) This System Plan does not include possible storage of ~300 West Valley canisters at SRS.

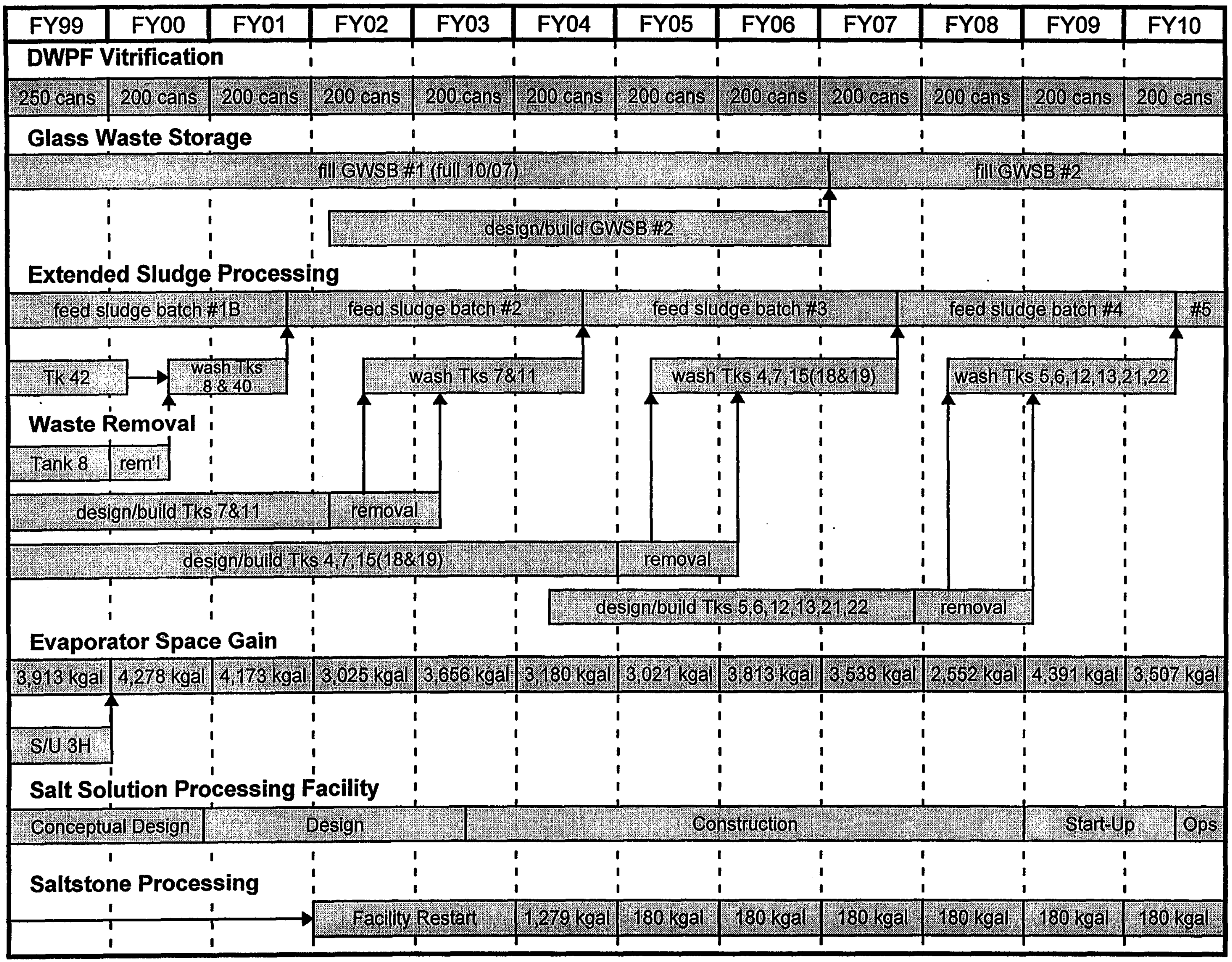
Appendix H.7 – Near Term Saltstone Operations (Planning Case)

FY	FY Start Date	Previous Year Tk 50 Inven. (Kgal)	ETF Conc (Kgal)	Material Fed to Saltstone (Kgal)	TK 50 Inventory (Kgal)	Grout Produced (Kgal)	Cum Vault Cells Filled	Active Vault #	Notes:
FY99	10/1/98	206 (as of 1/22/99)	120	0	326	0	3.50	---	3.2 cells already filled at the start of FY99. (3.0 cells in Vault 1 and 0.5 cells in Vault 4) Saltstone Facility in partial lay-up (not operating).
FY00	10/1/99	326	180	0	506	0	3.50	---	Saltstone Facility in partial lay-up (not operating).
FY01	10/1/00	506	180	0	686	0	3.50	---	Saltstone Facility in partial lay-up (not operating).
FY02	10/1/01	686	180	0	866	0	3.50	---	Saltstone Facility in partial lay-up (not operating).
FY03	10/1/02	866	180	0	1,046	0	3.50	---	Saltstone Facility in partial lay-up (not operating).
FY04	10/1/03	1,046	180	(1,226)	0	2,170	4.70	4	Saltstone Facility operates to de-inventory Tank 50.
FY05	10/1/04	0	180	(180)	0	319	4.87	4	Saltstone Facility operates as required to support ETF. Tank 50 mods required for return to waste storage by FY06
FY06	10/1/05	0	180	(180)	0	319	5.05	4	Saltstone Facility operates as required to support ETF.
FY07	10/1/06	0	180	(180)	0	319	5.22	4	Saltstone Facility operates as required to support ETF.
FY08	10/1/07	0	180	(180)	0	319	5.40	4	Saltstone Facility operates as required to support ETF.
FY09	10/1/08	0	180	(180)	0	319	5.57	4	Saltstone Facility operates as required to support ETF.
FY10	10/1/09	0	90	(90)	0	159	5.66	4	Saltstone Facility operates as required to support ETF.

Appendix H.8 - Useable Tank Space (Planning Case)



Appendix H.9 - Level 1 Schedule



Appendix I.1 – Funding (Requirements Case)

Budget Authority in Escalated Dollars

Project	Title	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12
HL-01	**H Tank Farm**														
	H Tank Farm Operations	84,057	87,851	98,861	99,353	101,495	102,461	103,348	106,139	107,743	110,652	113,640	111,240	114,244	84,167
	LI: Replacement Evap	9,418	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-01 Total	**93,474**	**87,851**	**98,861**	**99,353**	**101,495**	**102,461**	**103,348**	**106,139**	**107,743**	**110,652**	**113,640**	**111,240**	**114,244**	**84,167**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-02	**F Tank Farm**	**57,762**	**60,737**	**65,367**	**66,292**	**67,541**	**55,940**	**55,571**	**57,072**	**58,613**	**58,899**	**60,490**	**60,756**	**59,588**	**61,197**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-03	**Waste Removal & Tank Closures**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	2,257	1,943	3,384	3,358	6,894	10,621	10,908	11,202	11,505	20,402	27,348	25,513	16,952	17,410
	WR: Tank Closure	636	-	-	5,957	20,218	13,853	-	5,614	6,863	2,841	13,331	32,025	41,869	31,673
	HL-03 Total	**2,893**	**1,943**	**3,384**	**9,315**	**27,112**	**24,474**	**10,908**	**16,816**	**18,368**	**23,242**	**40,679**	**57,539**	**58,822**	**49,083**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	**57,379**	**58,446**	**59,098**	**58,347**	**59,923**	**61,541**	**63,202**	**64,909**	**66,661**	**68,461**	**70,310**	**72,208**	**74,158**	**76,160**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-05	**Vitrification**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vitrification Ops	133,962	126,614	144,616	146,750	150,727	152,564	154,250	163,110	164,838	168,221	174,249	176,226	186,505	188,155
	Failed Equip. Stor. Vaults	-	-	1,146	2,363	10	-	45	1,914	1,955	-	-	76	2,201	2,196
	HL-05 Total	**133,962**	**126,614**	**145,762**	**149,113**	**150,737**	**152,564**	**154,295**	**165,024**	**166,793**	**168,221**	**174,249**	**176,301**	**188,706**	**190,350**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-06	**Glass Waste Storage**	**494**	**368**	**362**	**8,540**	**38,895**	**46,015**	**39,446**	**24,465**	**805**	**827**	**849**	**872**	**4,390**	**11,687**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-13	**Salt Disposition**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Salt Disposition Ops	13,624	42,129	36,681	-	-	-	-	-	-	33,755	68,181	69,570	71,448	73,377
	LI: Salt Alternative	-	-	114,439	170,447	173,869	178,254	185,760	192,603	130,139	44,437	-	-	-	-
	HL-13 Total	**13,624**	**42,129**	**151,121**	**170,447**	**173,869**	**178,254**	**185,760**	**192,603**	**130,139**	**78,192**	**68,181**	**69,570**	**71,448**	**73,377**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	**1,590**	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-10	**LI: Storm Water Upgrades**	**2,044**	**4,430**	**249**	-	-	-	-	-	-	-	-	-	-	-
HL-11	**LI: Tk Fm Services Upgrade II**	**1,390**	**4,314**	**9,118**	**6,217**	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-12	**LI: Waste Removal**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	LI: WR from Tanks	25,127	14,134	43,637	38,832	31,345	37,714	41,291	55,781	60,268	50,248	61,557	51,413	37,933	45,401
	LI: Vit Upgrades	-	299	1,152	-	13,170	13,526	13,891	14,266	14,651	11,285	17,385	11,903	18,336	18,832
	LI: Pipe, Evaps & Infras.	-	-	936	6,191	10,191	11,324	4,326	-	-	-	-	-	-	-
	HL-12 Total	**25,127**	**14,433**	**45,724**	**45,024**	**54,707**	**62,564**	**59,508**	**70,047**	**74,920**	**61,533**	**78,942**	**63,316**	**56,270**	**64,232**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
FA-24	**Facility Decontamination and Decommissionin**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL TOTAL	**389,739**	**401,265**	**579,045**	**612,648**	**674,279**	**683,814**	**672,039**	**697,076**	**624,042**	**570,029**	**607,340**	**611,801**	**627,625**	**610,253**
Solid Waste Facilities		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CIF Operations	23,652	26,045	27,792	32,916	34,131	35,042	34,625	34,642	35,878	34,769	36,893	35,779	35,326	36,684
	ETF Operations	16,509	17,580	21,715	19,955	19,690	20,155	20,743	23,240	22,290	23,932	24,411	26,850	24,307	26,743
	Saltstone Operations	1,489	1,222	1,778	2,795	8,135	11,643	10,561	10,846	10,482	16,012	42,566	42,986	44,575	50,294
	SW TOTAL	41,650	44,847	51,285	55,666	61,956	66,840	65,929	68,729	68,650	74,713	103,870	105,615	104,208	113,722
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Life Cycle Cost	**431,389**	**446,112**	**630,330**	**668,315**	**736,234**	**750,654**	**737,968**	**765,804**	**692,692**	**644,742**	**711,210**	**717,417**	**731,833**	**723,975**

Note: FY00 is the President's Budget which has a funding allocation based on production of 100 canisters in FY00. Since then, SRS has committed to produce 200 canisters in FY00, which will require a re-distribution of funding among the PBS's.

Appendix I.1 – Funding (Requirements Case)

Budget Authority in Escalated Dollars

Project	Title	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
HL-01	**H Tank Farm**														
	H Tank Farm Operations	86,439	88,773	91,170	92,028	76,393	78,456	77,099	77,396	79,486	81,632	83,836	76,175	36,442	-
	LI: Replacement Evap	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-01 Total	**86,439**	**88,773**	**91,170**	**92,028**	**76,393**	**78,456**	**77,099**	**77,396**	**79,486**	**81,632**	**83,836**	**76,175**	**36,442**	**-**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-02	**F Tank Farm**	**62,850**	**64,547**	**66,289**	**66,475**	**64,976**	**65,038**	**40,733**	**33,804**	**32,884**	**31,890**	**26,953**	**25,695**	**10,081**	**-**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-03	**Waste Removal & Tank Closures**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	17,432	17,518	17,991	13,858	14,232	14,616	7,505	7,708	7,916	8,130	8,349	8,575	-	-
	WR: Tank Closure	-	-	51	48,522	49,128	34,169	35,584	21,175	9,878	10,228	73,086	114,932	135,248	84,551
	HL-03 Total	**17,432**	**17,518**	**18,042**	**62,379**	**63,360**	**48,785**	**43,089**	**28,883**	**17,794**	**18,358**	**81,436**	**123,507**	**135,248**	**84,551**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	**78,216**	**80,328**	**82,497**	**84,724**	**87,012**	**89,361**	**91,774**	**94,252**	**96,796**	**99,410**	**51,047**	**52,425**	**-**	**-**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-05	**Vitrification**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vitrification Ops	192,265	199,025	201,332	213,307	214,736	219,743	227,324	230,015	241,039	232,353	235,622	239,256	-	-
	Failed Equip. Stor. Vaults	-	-	114	2,537	2,458	-	-	161	2,917	2,759	-	-	-	-
	HL-05 Total	**192,265**	**199,025**	**201,446**	**215,844**	**217,194**	**219,743**	**227,324**	**230,176**	**243,956**	**235,113**	**235,622**	**239,256**	**-**	**-**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-06	**Glass Waste Storage**	**13,845**	**10,434**	**1,992**	**2,046**	**2,101**	**2,158**	**2,216**	**2,276**	**2,338**	**2,401**	**2,465**	**2,532**	**1,950**	**296**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-13	**Salt Disposition**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Salt Disposition Ops	75,358	77,393	79,896	81,629	84,378	86,208	88,651	90,926	93,381	95,778	98,492	85,514	-	-
	LI: Salt Alternative	-	-	-	-	47,200	64,632	49,783	-	-	-	-	-	-	-
	HL-13 Total	**75,358**	**77,393**	**79,896**	**81,629**	**131,578**	**150,840**	**138,434**	**90,926**	**93,381**	**95,778**	**98,492**	**85,514**	**-**	**-**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-10	**LI: Storm Water Upgrades**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-11	**LI: Tk Fm Services Upgrade II**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-12	**LI: Waste Removal**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	LI: WR from Tanks	69,084	34,648	54,254	67,195	34,302	32,216	33,880	41,304	54,722	51,648	44,506	35,994	36,747	8,093
	LI: Vit Upgrades	19,340	13,241	13,599	-	-	-	-	-	-	-	-	-	-	-
	LI: Pipe, Evaps & Infras.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-12 Total	**88,424**	**47,889**	**67,853**	**67,195**	**34,302**	**32,216**	**33,880**	**41,304**	**54,722**	**51,648**	**44,506**	**35,994**	**36,747**	**8,093**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
FA-24	**Facility Decontamination and Decommissionin**	**-**	**-**	**42,207**	**35,465**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**700**	**246,763**	**301,125**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL TOTAL	**614,830**	**585,907**	**651,392**	**707,786**	**676,916**	**686,597**	**654,549**	**599,017**	**621,357**	**616,230**	**624,357**	**641,798**	**467,231**	**394,066**
Solid Waste Facilities		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CIF Operations	39,125	38,161	39,898	45,151	41,538	43,587	47,919	44,278	45,539	51,598	47,950	48,479	-	-
	ETF Operations	26,077	26,329	28,643	29,082	31,926	33,493	32,226	34,583	32,080	32,947	35,850	34,543	-	-
	Saltstone Operations	50,493	48,454	47,208	49,057	51,007	53,373	72,251	56,882	58,425	59,532	48,726	33,409	-	-
	SW TOTAL	115,695	112,945	115,749	123,290	124,472	130,453	152,396	135,743	136,045	144,077	132,526	116,430	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Life Cycle Cost	**730,525**	**698,851**	**767,142**	**831,075**	**801,388**	**817,050**	**806,946**	**734,760**	**757,402**	**760,307**	**756,883**	**758,229**	**467,231**	**394,066**

Appendix I.1 – Funding (Requirements Case)

Budget Authority in Escalated Dollars

Project	Title	FY27	FY28		Cumulative FY99-End
HL-01	**H Tank Farm**				
	H Tank Farm Operations	-	-	-	2,450,578
	LI: Replacement Evap	-	-	-	9,418
	HL-01 Total	**-**	**-**	**-**	**2,459,996**
		-	-	-	-
HL-02	**F Tank Farm**	**-**	**-**	**-**	**1,438,040**
		-	-	-	-
HL-03	**Waste Removal & Tank Closures**	**-**	**-**	**-**	**-**
	WR Ops w/ Demo Projs	-	-	-	313,528
	WR: Tank Closure	-	-	-	791,433
	HL-03 Total	**-**	**-**	**-**	**1,104,961**
		-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	**-**	**-**	**-**	**1,898,644**
		-	-	-	-
HL-05	**Vitrification**	**-**	**-**	**-**	**-**
	Vitrification Ops	-	-	-	4,876,804
	Failed Equip. Stor. Vaults	-	-	-	22,852
	HL-05 Total	**-**	**-**	**-**	**4,899,657**
		-	-	-	-
HL-06	**Glass Waste Storage**	**-**	**-**	**-**	**227,067**
		-	-	-	-
HL-13	**Salt Disposition**	**-**	**-**	**-**	**-**
	Salt Disposition Ops	-	-	-	1,446,369
	LI: Salt Alternative	-	-	-	1,351,565
	HL-13 Total	**-**	**-**	**-**	**2,797,934**
		-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	**-**	**-**	**-**	**1,590**
HL-10	**LI: Storm Water Upgrades**	**-**	**-**	**-**	**6,723**
HL-11	**LI: Tk Fm Services Upgrade II**	**-**	**-**	**-**	**21,039**
		-	-	-	-
HL-12	**LI: Waste Removal**	**-**	**-**	**-**	**-**
	LI: WR from Tanks	-	-	-	1,193,274
	LI: Vit Upgrades	-	-	-	194,877
	LI: Pipe, Evaps & Infras.	-	-	-	32,967
	HL-12 Total	**-**	**-**	**-**	**1,421,118**
		-	-	-	-
FA-24	**Facility Decontamination and Decommissionin**	**1,955**	**-**	**-**	**628,214**
		-	-	-	-
	HL TOTAL	**1,955**	**-**	**-**	**16,904,983**
Solid Waste Facilities		-	-	-	-
	CIF Operations	-	-	-	997,400
	ETF Operations	-	-	-	685,899
	Saltstone Operations	-	-	-	884,201
	SW TOTAL	-	-	-	2,567,500
		-	-	-	-
	Life Cycle Cost	**1,955**	**-**	**-**	**19,472,483**

Appendix I.1 – Funding (Requirements Case)

Budget Authority in Constant Dollars

Project	Title	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12
HL-01	**H Tank Farm**														
	H Tank Farm Operations	84,057	84,798	92,109	90,135	89,657	88,131	86,557	86,557	85,556	85,556	85,556	81,547	81,547	58,499
	LI: Replacement Evap	9,418	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-01 Total	93,474	84,798	92,109	90,135	89,657	88,131	86,557	86,557	85,556	85,556	85,556	81,547	81,547	58,499
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-02	**F Tank Farm**	57,762	58,626	60,903	60,141	59,664	48,116	46,543	46,543	46,543	45,540	45,540	44,538	42,534	42,534
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-03	**Waste Removal & Tank Closures**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	2,257	1,875	3,153	3,046	6,090	9,136	9,136	9,136	9,136	15,774	20,590	18,703	12,101	12,101
	WR: Tank Closure	636	-	-	5,404	17,859	11,916	-	4,578	5,450	2,197	10,037	23,477	29,886	22,014
	HL-03 Total	2,893	1,875	3,153	8,451	23,950	21,051	9,136	13,714	14,585	17,971	30,626	42,180	41,987	34,114
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	57,379	56,415	55,062	52,934	52,934	52,934	52,934	52,934	52,934	52,934	52,934	52,934	52,934	52,934
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-05	**Vitrification**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vitrification Ops	133,962	122,214	134,740	133,134	133,147	131,227	129,189	133,017	130,893	130,067	131,186	129,186	133,127	130,774
	Failed Equip. Stor. Vaults	-	-	1,068	2,143	9	-	38	1,561	1,552	-	-	55	1,571	1,526
	HL-05 Total	133,962	122,214	135,808	135,277	133,155	131,227	129,227	134,578	132,445	130,067	131,186	129,242	134,698	132,300
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-06	**Glass Waste Storage**	494	355	337	7,748	34,359	39,580	33,037	19,952	639	639	639	639	3,134	8,123
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-13	**Salt Disposition**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Salt Disposition Ops	13,624	40,665	34,176	-	-	-	-	-	-	26,099	51,331	51,000	51,000	51,000
	LI: Salt Alternative	-	-	106,624	154,632	153,589	153,324	155,579	157,070	103,339	34,359	-	-	-	-
	HL-13 Total	13,624	40,665	140,801	154,632	153,589	153,324	155,579	157,070	103,339	60,458	51,331	51,000	51,000	51,000
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	1,590	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-10	**LI: Storm Water Upgrades**	2,044	4,276	232	-	-	-	-	-	-	-	-	-	-	-
HL-11	**LI: Tk Fm Services Upgrade II**	1,390	4,164	8,496	5,640	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-12	**LI: Waste Removal**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	LI: WR from Tanks	25,127	13,643	40,657	35,229	27,689	32,440	34,582	45,490	47,857	38,851	46,344	37,689	27,077	31,555
	LI: Vit Upgrades	-	289	1,073	-	11,634	11,634	11,634	11,634	11,634	8,726	13,089	8,726	13,089	13,089
	LI: Pipe, Evaps & Infras.	-	-	872	5,617	9,003	9,740	3,623	-	-	-	-	-	-	-
	HL-12 Total	25,127	13,931	42,601	40,846	48,326	53,814	49,839	57,124	59,491	47,577	59,432	46,415	40,165	44,644
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
FA-24	**Facility Decontamination and Decommissionin**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL TOTAL	389,739	387,321	539,502	555,804	595,633	588,176	562,851	568,471	495,532	440,742	457,245	448,494	447,998	424,146
Solid Waste Facilities		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CIF Operations	23,652	25,140	25,894	29,862	30,150	30,141	29,000	28,251	28,489	26,883	27,775	26,229	25,216	25,497
	ETF Operations	16,509	16,969	20,232	18,103	17,394	17,336	17,373	18,953	17,700	18,504	18,378	19,683	17,350	18,587
	Saltstone Operations	1,489	1,180	1,657	2,536	7,186	10,015	8,845	8,845	8,323	12,381	32,046	31,512	31,817	34,956
	SW TOTAL	41,650	43,289	47,782	50,501	54,729	57,492	55,217	56,049	54,512	57,768	78,200	77,424	74,384	79,040
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Life Cycle Cost	431,389	430,610	587,284	606,305	650,363	645,668	618,068	624,520	550,044	498,509	535,445	525,918	522,382	503,187

Note: FY00 is the President's Budget which has a funding allocation based on production of 100 canisters in FY00. Since then, SRS has committed to produce 200 canisters in FY00, which will require a re-distribution of funding among the PBS's.

Appendix I.1 – Funding (Requirements Case)

Budget Authority in Constant Dollars

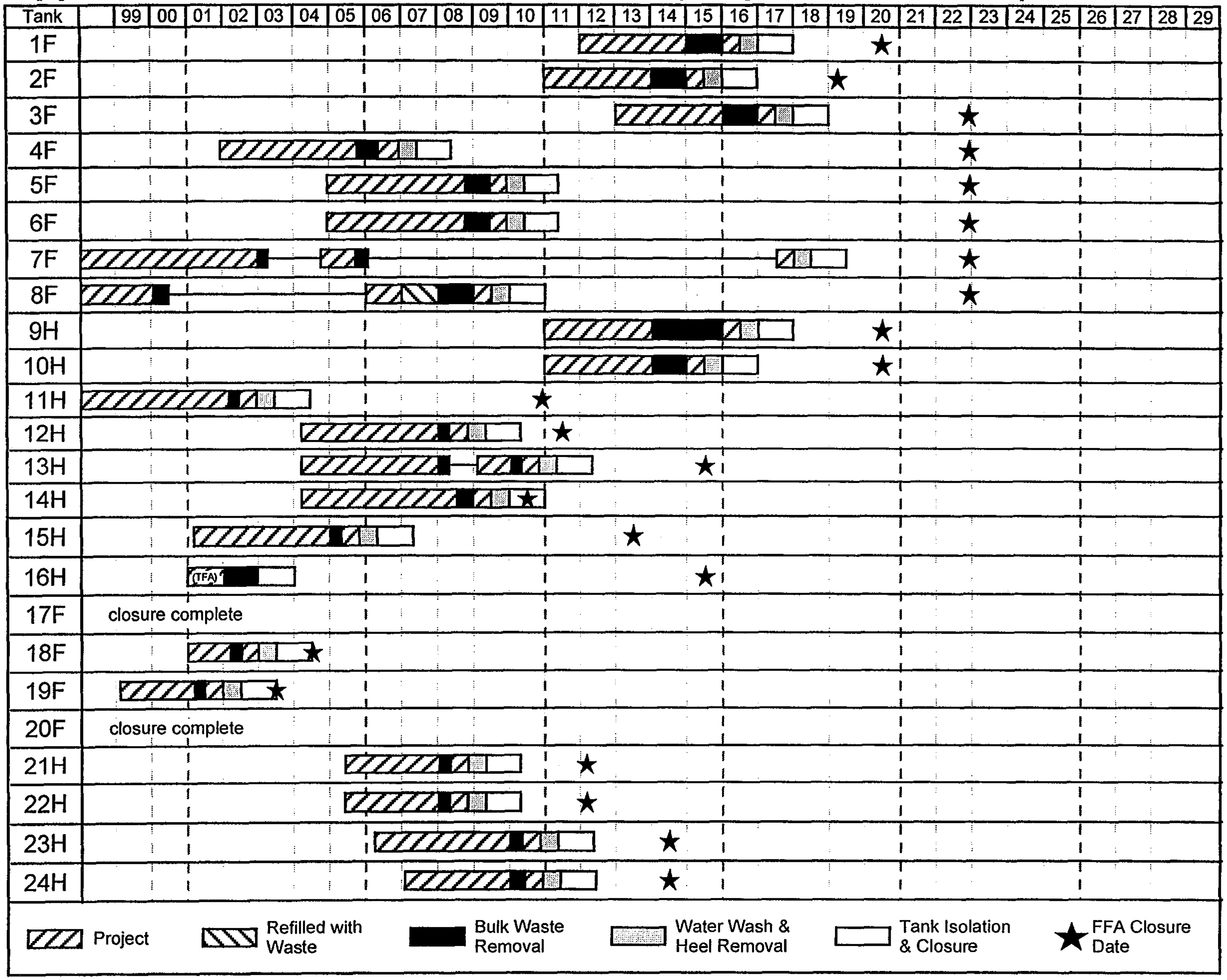
Project	Title	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
HL-01	**H Tank Farm**														
	H Tank Farm Operations	58,499	58,499	58,499	57,497	46,474	46,474	44,469	43,467	43,467	43,467	43,467	38,457	17,914	-
	LI: Replacement Evap	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-01 Total	**58,499**	**58,499**	**58,499**	**57,497**	**46,474**	**46,474**	**44,469**	**43,467**	**43,467**	**43,467**	**43,467**	**38,457**	**17,914**	**-**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-02	**F Tank Farm**	**42,534**	**42,534**	**42,534**	**41,532**	**39,528**	**38,526**	**23,494**	**18,985**	**17,983**	**16,981**	**13,974**	**12,972**	**4,955**	**-**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-03	**Waste Removal & Tank Closures**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	11,797	11,544	11,544	8,658	8,658	8,658	4,329	4,329	4,329	4,329	4,329	4,329	-	-
	WR: Tank Closure	-	-	33	30,315	29,887	20,240	20,524	11,892	5,402	5,446	37,894	58,023	66,485	40,471
	HL-03 Total	**11,797**	**11,544**	**11,577**	**38,973**	**38,545**	**28,898**	**24,853**	**16,221**	**9,731**	**9,775**	**42,223**	**62,352**	**66,485**	**40,471**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**52,934**	**26,467**	**26,467**	**-**	**-**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-05	**Vitrification**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vitrification Ops	130,117	131,151	129,184	133,269	130,635	130,166	131,117	129,181	131,813	123,723	122,165	120,788	-	-
	Failed Equip. Stor. Vaults	-	-	73	1,585	1,496	-	-	90	1,595	1,469	-	-	-	-
	HL-05 Total	**130,117**	**131,151**	**129,257**	**134,854**	**132,130**	**130,166**	**131,117**	**129,272**	**133,408**	**125,192**	**122,165**	**120,788**	**-**	**-**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-06	**Glass Waste Storage**	**9,370**	**6,875**	**1,278**	**1,278**	**1,278**	**1,278**	**1,278**	**1,278**	**1,278**	**1,278**	**1,278**	**1,278**	**959**	**142**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-13	**Salt Disposition**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Salt Disposition Ops	51,000	51,000	51,265	51,000	51,331	51,066	51,132	51,066	51,066	51,000	51,066	43,172	-	-
	LI: Salt Alternative	-	-	-	-	28,714	38,285	28,714	-	-	-	-	-	-	-
	HL-13 Total	**51,000**	**51,000**	**51,265**	**51,000**	**80,045**	**89,351**	**79,846**	**51,066**	**51,066**	**51,000**	**51,066**	**43,172**	**-**	**-**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-10	**LI: Storm Water Upgrades**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-11	**LI: Tk Fm Services Upgrade II**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-12	**LI: Waste Removal**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	LI: WR from Tanks	46,754	22,832	34,812	41,982	20,868	19,083	19,541	23;197	29,925	27,502	23,075	18,171	18,064	3,874
	LI: Vit Upgrades	13,089	8,726	8,726	-	-	-	-	-	-	-	-	-	-	-
	LI: Pipe, Evaps & Infras.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-12 Total	**59,842**	**31,557**	**43,537**	**41,982**	**20,868**	**19,083**	**19,541**	**23,197**	**29,925**	**27,502**	**23,075**	**18,171**	**18,064**	**3,874**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
FA-24	**Facility Decontamination and Decommissionin**	**-**	**-**	**27,082**	**22,158**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**353**	**121,302**	**144,134**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL TOTAL	**416,093**	**386,094**	**417,962**	**442,207**	**411,802**	**406,710**	**377,533**	**336,420**	**339,792**	**328,128**	**323,716**	**324,010**	**229,679**	**188,620**
Solid Waste Facilities		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CIF Operations	26,478	25,147	25,601	28,209	25,270	25,819	27,639	24,867	24,903	27,475	24,861	24,474	-	-
	ETF Operations	17,648	17,350	18,378	18,170	19,422	19,840	18,587	19,422	17,543	17,543	18,587	17,439	-	-
	Saltstone Operations	34,172	31,930	30,291	30,650	31,030	31,616	41,673	31,946	31,950	31,700	25,263	16,866	-	-
	SW TOTAL	78,298	74,427	74,270	77,028	75,723	77,274	87,900	76,236	74,397	76,718	68,712	58,779	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Life Cycle Cost	**494,390**	**460,521**	**492,232**	**519,235**	**487,524**	**483,984**	**465,433**	**412,656**	**414,189**	**404,846**	**392,427**	**382,790**	**229,679**	**188,620**

Appendix I.1 – Funding (Requirements Case)

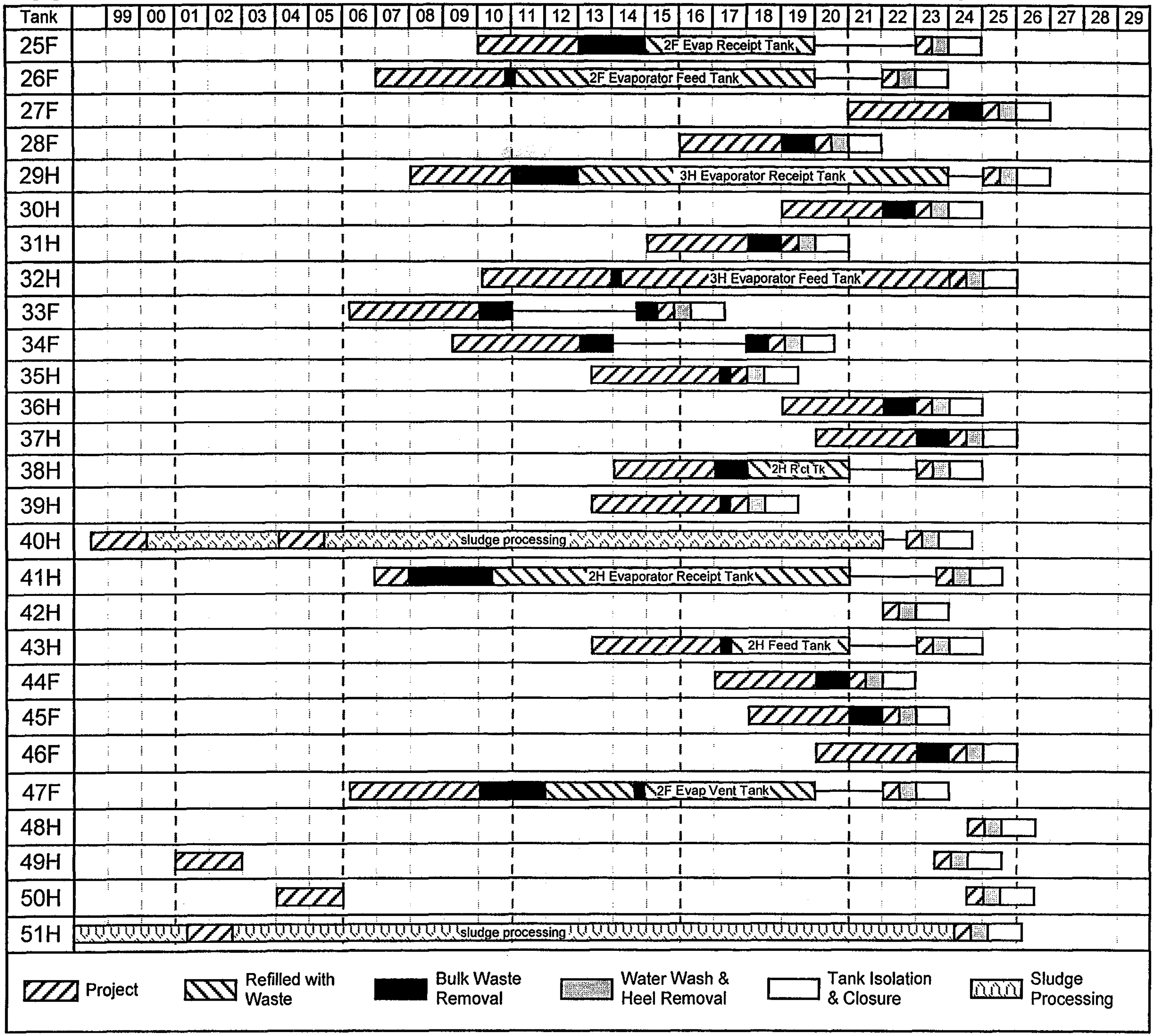
Budget Authority in Constant Dollars

Project	Title	FY27	FY28		FY99-End
HL-01	**H Tank Farm**				
	H Tank Farm Operations	-	-	-	1,780,911
	LI: Replacement Evap	-	-	-	9,418
	HL-01 Total	**-**	**-**	**-**	**1,790,329**
		-	-	-	-
HL-02	**F Tank Farm**	**-**	**-**	**-**	**1,062,061**
		-	-	-	-
HL-03	**Waste Removal & Tank Closures**	**-**	**-**	**-**	**-**
	WR Ops w/ Demo Projs	-	-	-	219,065
	WR: Tank Closure	-	-	-	460,065
	HL-03 Total	**-**	**-**	**-**	**679,130**
		-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	**-**	**-**	**-**	**1,333,395**
		-	-	-	-
HL-05	**Vitrification**	**-**	**-**	**-**	**-**
	Vitrification Ops	-	-	-	3,379,171
	Failed Equip. Stor. Vaults	-	-	-	15,833
	HL-05 Total	**-**	**-**	**-**	**3,395,003**
		-	-	-	-
HL-06	**Glass Waste Storage**	**-**	**-**	**-**	**179,803**
		-	-	-	-
HL-13	**Salt Disposition**	**-**	**-**	**-**	**-**
	Salt Disposition Ops	-	-	-	924,056
	LI: Salt Alternative	-	-	-	1,114,230
	HL-13 Total	**-**	**-**	**-**	**2,038,286**
		-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	**-**	**-**	**-**	**1,590**
HL-10	**LI: Storm Water Upgrades**	**-**	**-**	**-**	**6,553**
HL-11	**LI: Tk Fm Services Upgrade II**	**-**	**-**	**-**	**19,690**
		-	-	-	-
HL-12	**LI: Waste Removal**	**-**	**-**	**-**	**-**
	LI: WR from Tanks	-	-	-	833,909
	LI: Vit Upgrades	-	-	-	146,790
	LI: Pipe, Evaps & Infras.	-	-	-	28,854
	HL-12 Total	**-**	**-**	**-**	**1,009,553**
		-	-	-	-
FA-24	**Facility Decontamination and Decommissionin**	**911**	**-**	**-**	**315,940**
		-	-	-	-
	HL TOTAL	**911**	**-**	**-**	**11,831,331**
Solid Waste Facilities		-	-	-	-
	CIF Operations	-	-	-	692,924
	ETF Operations	-	-	-	473,002
	Saltstone Operations	-	-	-	561,874
	SW TOTAL	-	-	-	1,727,799
		-	-	-	-
	Life Cycle Cost	**911**	**-**	**-**	**13,559,130**

Appendix I.2 Waste Removal Schedule (Requirements Case)



Appendix I.2 Waste Removal Schedule (Requirements Case)



Appendix I.3 - Tank Farm Material Balance (Requirements Case)

End of Mo/Yr	Influents (gal) F Canyon LHW	F Canyon HHW	H Canyon LHW	H Canyon HHW	DWPF Recycle Sludge	DWPF Recycle Salt	ESP WW	Tank WW	Other	Backlog Tk	Backlog Volume (gal)	SGF	Ev	Type I & III Tanks Reused (kgal) Tk	Volume	Effluents (gal) 2F Evap	2H Evap	RHLWE	Salt Proc.	Other	Usable Space (gal)	Notes
Jan-99																					1,769,318	Actual inventory (Ref. Date Jan 22)
Feb-99	17,500	1,800	30,000		186,369				37,667	26,32,43	200,000	0.40	2F/2H			75,003	245,399				1,816,384	
Mar-99	27,500	1,800	40,000		186,369				37,667	26,32,43	200,000	0.40	2F/2H			82,103	252,499				1,857,650	
Apr-99	45,500	1,800	45,000		186,369				37,667	26,32,43	200,000	0.40	2F/2H			94,883	256,049				1,892,246	
May-99	27,500	1,800	30,000		186,369				37,667	26,32,43	200,000	0.40	2F/2H			82,103	245,399				1,936,412	
Jun-99	10,500	1,800	30,000		186,369				37,667	26,32,43	190,000	0.40	2F/2H			65,033	245,399				1,980,509	
Jul-99	27,500	1,800	30,000		186,369				37,667	43	100,000	0.30	2H			32,103	245,399				1,974,675	
Aug-99	10,500	1,800	30,000		186,369				37,667	33,35,38	512,000	0.62	2F/2H			277,053	276,899				2,262,291	
Sep-99	27,500	1,800	16,000		186,369				37,667	35	200,000	0.64	2F			160,103	205,459			(21,240)	2,337,277	Tank 22 fed to 2H Evaporator
FY99	194,000	14,400	251,000		1,490,952				301,333		1,802,000					868,384	1,972,500			(21,240)		
Oct-99	10,500	1,800	36,000		163,374				37,667	35	200,000	0.64	2F			148,033	162,204	36,759			2,434,932	
Nov-99	27,500	1,800	30,000		163,374				37,667	35	100,000	0.64	2F			96,103	157,944	36,759			2,465,398	
Dec-99	10,500	1,800	30,000		163,374				37,667	30	200,000	0.30	RE			20,033	157,944	96,759			2,496,794	
Jan-00	27,500	1,800	30,000		163,374				37,667	30	200,000	0.30	RE			32,103	157,944	96,759			2,523,259	
Feb-00	10,500	1,800	30,000		163,374				37,667	30	200,000	0.30	RE			20,033	157,944	96,759			2,554,655	Xfer 1051 Kgal Tk40 to Tk42
Mar-00	27,500	1,800	30,000		163,374				37,667	30&39	400,000	0.44	RE			32,103	157,944	212,759		(1,098,000)	1,599,120	Tk 40 to ESP service
Apr-00	10,500	1,800	30,000		163,374				37,667	30&39	400,000	0.44	RE			20,033	157,944	212,759			1,746,516	
May-00	27,500	1,800	30,000		163,374				37,667	39	200,000	0.57	RE			32,103	157,944	150,759			1,826,982	
Jun-00	10,500	1,800	30,000		163,374				37,667	39	200,000	0.57	RE			20,033	157,944	150,759			1,912,377	
Jul-00	27,500	1,800	30,000		163,374		390,000		37,667	39	100,000	0.57	RE			151,443	157,944	305,919			1,877,343	
Aug-00	10,500	1,800	30,000		163,374				37,667							20,033	157,944	36,759			1,848,738	
Sep-00	27,500	1,800	30,000		163,374		338,000		37,667							135,531	157,944	220,631			1,764,504	
FY00	228,000	21,600	366,000		1,960,488		728,000		452,000		2,200,000					727,584	1,899,589	1,654,142		(1,098,000)		
Oct-00	10,500	1,800	50,000		163,374				37,667	42	200,000	0.37	RE			20,033	135,385	147,518			1,804,100	Tank 42 Backlog from Tank 40
Nov-00	27,500	1,800	30,000		163,374		338,000		37,667	42	200,000	0.37	RE			135,531	121,185	331,390			1,793,865	
Dec-00	10,500	1,800	30,000		163,374		338,000		37,667	42	200,000	0.37	RE			123,461	121,185	331,390			1,788,561	
Jan-01	27,500	1,800	30,000		163,374				37,667	42	200,000	0.37	RE			32,103	121,185	147,518			1,829,026	
Feb-01	10,500	1,800	30,000		163,374		338,000		37,667	42	200,000	0.37	RE			123,461	121,185	331,390			1,823,722	
Mar-01	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518			1,790,188	
Apr-01	10,500	1,800	30,000		163,374		338,000		37,667							123,461	121,185	257,390			1,710,883	
May-01	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518			1,677,349	
Jun-01	10,500	1,800	30,000		163,374				37,667							20,033	121,185	73,518			1,648,744	
Jul-01	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518			1,615,210	
Aug-01	10,500	1,800	30,000		163,374				37,667							20,033	121,185	73,518			1,586,606	
Sep-01	27,500	1,800	16,000		163,374				37,667							32,103	111,245	73,518			1,557,131	
FY01	228,000	21,600	366,000		1,960,488		1,352,000		452,000		1,000,000					726,528	1,458,480	1,987,708				

Appendix I.3 - Tank Farm Material Balance (Requirements Case)

End of	Influents (gal)									Backlog				Type I & III Tanks Reused (kgal)		Effluents (gal)					Usable Space	
	F Canyon		H Canyon		DWPF Recycle		ESP	Tank			Volume											
Mo/Yr	LHW	HHW	LHW	HHW	Sludge	Salt	WW	WW	Other	Tk	(gal)	SGF	Ev	Tk	Volume	2F Evap	2H Evap	RHLWE	Salt Proc.	Other	(gal)	Notes
Oct-01	10,500	1,800	50,000		163,374				37,667							20,033	135,385	73,518			1,522,727	
Nov-01	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518			1,489,192	
Dec-01	10,500	1,800	30,000		163,374				37,667							20,033	121,185	73,518			1,460,588	
Jan-02	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518			1,427,054	
Feb-02	10,500	1,800	30,000		163,374				37,667							20,033	121,185	73,518		(68,950)	1,329,499	Tank 11 Supernate fed to Evap
Mar-02	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518		(73,990)	1,221,975	Tank 7 Supernate fed to Evap
Apr-02	10,500	1,800	30,000		163,374			140,000	37,667							74,319	121,185	152,233			1,186,370	
May-02	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518			1,152,836	
Jun-02	10,500	1,800	30,000		163,374		280,000		37,667							105,713	121,185	225,838			1,082,232	
Jul-02	27,500	1,800	30,000		163,374				37,667							32,103	121,185	73,518			1,048,697	
Aug-02	10,500	1,800	30,000		163,374				37,667							20,033	121,185	73,518			1,020,093	
Sep-02	27,500	1,800	16,000		163,374				37,667							32,103	111,245	73,518			990,618	
FY02	228,000	21,600	366,000		1,960,488		280,000	140,000	452,000							452,782	1,458,480	1,113,254		(142,940)		
FY03	135,000	3,600	56,000		1,960,488		1,374,000	330,000	452,000					49	100	782,409	1,238,380	1,815,216		1,271,000	1,786,536	Tk 49 Ready for Storage by FY03
FY04	120,000		56,000		1,960,488		774,000		452,000					49	350	457,644	1,238,380	1,303,276			1,423,347	
FY05	120,000		56,000		1,960,488		800,000		452,000					49	820	465,600	1,238,380	1,317,420		(228,100)	828,158	Tk 4,7,18,19 Supernate fed to Evap
FY06	120,000		56,000		1,960,488		1,676,000	190,000	452,000					50	300	807,329	1,238,380	1,900,790		1,271,000	1,591,169	Tk 50 Ready for Storage by FY06
FY07	120,000		56,000		1,960,488		1,196,000	140,000	452,000					50 / 8	968 /100	641,062	1,238,380	1,611,558		(168,000)	989,680	Tk 13 Sup xfr to 50, 8 ready for Storage
FY08	120,000		56,000		1,960,488	160,000	430,000		297,000							305,880	1,201,880	1,188,140	950,000		1,612,092	Start Salt Processing 4/08
FY09	120,000		56,000		1,960,488	320,000	2,068,000	660,000	297,000							915,679	1,273,880	2,308,640	1,672,000		2,680,803	
FY10	120,000		56,000		1,960,488	320,000	944,000	280,000	297,000							645,409	1,273,880	1,804,011	2,843,000		5,079,614	
FY11					1,960,488	320,000	1,579,000	470,000	297,000							754,519	1,234,120	2,149,451	2,648,000		7,659,215	
FY12					1,960,488	320,000	2,051,000	50,000	297,000							736,094	1,234,120	2,170,076	2,384,000		9,555,016	
FY13					1,960,488	320,000			297,000							89,100	1,234,120	1,026,220	2,303,000		11,489,968	
FY14					1,960,488	320,000	800,000	140,000	297,000							388,186	1,234,120	1,540,134	1,103,000		12,047,919	
FY15					1,960,488	320,000	1,648,000	330,000	297,000							721,347	1,234,120	2,108,272	1,240,000		12,606,170	
FY16					1,960,488	320,000	1,872,000	520,000	297,000							863,565	1,234,120	2,336,955	1,617,000		Start Closing	
FY17					1,960,488	320,000	250,000	140,000	297,000							219,886	1,234,120	1,240,934	1,789,000		Type III Tanks	
FY18					1,960,488	320,000	1,450,000	420,000	297,000							695,657	1,234,120	2,051,162	1,817,000			
FY19					1,960,488	320,000	600,000	280,000	297,000							381,271	1,234,120	1,510,048	2,176,000			
FY20					1,960,488	320,000	110,000	420,000	297,000							285,617	1,234,120	1,322,202	1,897,000			
FY21					1,960,488	320,000	680,000	420,000	297,000							460,037	1,234,120	1,632,282	2,175,000			
FY22					1,960,488	320,000		140,000	297,000							143,386	1,234,120	1,104,934	2,277,000			2F shuts down end of FY22
FY23					1,960,488	320,000		700,000	297,000								1,234,120	1,780,320	2,008,000			2H shuts down end of FY23
FY24					1,520,132	248,123		420,000	297,000									2,287,430	1,572,000			RHLWE shuts down end of program
FY25								980,000	297,000									1,228,000				
FY26																						
FY27																						

Appendix I.4 - Salt Solution Processing (Requirements Case)

SALT SOLUTION PROCESSING FACILITY									SALTSTONE FACILITY				
Fiscal Year	FY Start Date	Source Tank	Waste Removed (Kgal)	Feed Type	Salt Feed to Salt Processing (Kgal)	NaTPB Req'd (Kgal)	10 wt% ppt Feed to DWPF (Kgal)	Ppt Cs Conc (Ci/gal)	Salt Processing Filtrate to Grout (Kgal)	ETF Feed to Grout (Kgal)	Grout Produced (Kgal)	Cum Vault Cells Filled	Active Grout Vault #'s
FY08	10/1/07	14	153	ds	413	100	163	47.6	3,225	90	5,868	8.54	4
		26	100	cs	100								
		30	300	cs	300								
		38	300	cs	300								
		46	250	cs	250								
				dw	741								
		Type III Tank space gain	950	total	2,104								
FY09	10/1/08	26	400	cs	400	202	329	31.0	4,446	180	8,188	13.06	4 and 1
		27	260	cs	260								
		30	490	cs	490								
		33	127	cs	127								
		41	16	cs	16								
		41	269	ds	725								
		47	110	cs	110								
				dw	916								
		Type III Tank space gain	1,672	total	3,044								
FY10	10/1/09	25	60	cs	60	197	325	40.2	7,300	180	13,240	20.36	1, 2 and 3
		29	217	cs	217								
		32	621	cs	621								
		33	222	ds	600								
		38	140	cs	140								
		41	148	ds	400								
		43	394	cs	394								
		46	300	cs	300								
		47	741	ds	2,000								
				dw	389								
		Type III Tank space gain	2,843	total	5,121								
FY11	10/1/10	25	55	cs	55	197	325	31.8	7,431	180	13,471	27.78	3 and 5
		29	74	ds	200								
		30	470	cs	470								
		34	250	cs	250								
		35	100	cs	100								
		38	300	cs	300								
		41	789	ds	2,131								
		46	500	cs	500								
		47	110	ds	297								
				dw	912								
		Type III Tank space gain	2,648	total	5,215								

Appendix I.4 - Salt Solution Processing (Requirements Case)

SALT SOLUTION PROCESSING FACILITY									SALTSTONE FACILITY				
Fiscal Year	FY Start Date	Source Tank	Waste Removed (Kgal)	Feed Type	Salt Feed to Salt Processing (Kgal)	NaTPB Req'd (Kgal)	10 wt% ppt Feed to DWPF (Kgal)	Ppt Cs Conc (Ci/gal)	Salt Processing Filtrate to Grout (Kgal)	ETF Feed to Grout (Kgal)	Grout Produced (Kgal)	Cum Vault Cells Filled	Active Grout Vault #'s
FY12	10/1/11	25	48	cs	48	197	324	31.4	7,142	180	12,960	34.93	5 and 6
		25	185	ds	500								
		29	906	ds	2,446								
		30	300	cs	300								
		34	625	cs	625								
		35	200	cs	200								
		38	120	cs	120								
				dw	763								
	Type III Tank space gain		2,384	total	5,002								
FY13	10/1/12	25	900	ds	2,431	197	324	44.7	7,325	180	13,284	42.25	6 and 7
		27	50	cs	50								
		34	45	cs	45								
		34	208	ds	561								
		35	500	cs	500								
		38	150	cs	150								
		39	450	cs	450								
				dw	950								
	Type III Tank space gain		2,303	total	5,137								
FY14	10/1/13	2	525	ds	1,418	197	325	34.1	7,407	180	13,429	49.65	7 and 8
		9	389	ds	1,050								
		10	209	ds	563								
		30	220	cs	220								
		35	433	cs	433								
		39	150	cs	150								
		46	300	cs	300								
				dw	1,068								
	Type III Tank space gain		1,103	total	5,202								
FY15	10/1/14	1	19	cs	19	201	328	33.3	5,587	180	10,208	55.28	8 and 9
		1	470	ds	1,270								
		9	138	ds	373								
		27	120	cs	120								
		30	100	cs	100								
		38	270	cs	270								
		39	250	cs	250								
		46	500	cs	500								
				dw	972								
	Type III Tank space gain		1,240	total	3,874								

Appendix I.4 - Salt Solution Processing (Requirements Case)

SALT SOLUTION PROCESSING FACILITY									SALTSTONE FACILITY				
Fiscal Year	FY Start Date	Source Tank	Waste Removed (Kgal)	Feed Type	Salt Feed to Salt Processing (Kgal)	NaTPB Req'd (Kgal)	10 wt% ppt Feed to DWPF (Kgal)	Ppt Cs Conc (Ci/gal)	Salt Processing Filtrate to Grout (Kgal)	ETF Feed to Grout (Kgal)	Grout Produced (Kgal)	Cum Vault Cells Filled	Active Grout Vault #'s
FY16	10/1/15	3	525	ds	1,418	197	323	33.3	5,853	180	10,678	61.17	9 and 10
		30	389	cs	389								
		38	201	cs	201								
		39	321	cs	321								
		42	220	cs	220								
		43	56	cs	56								
		46	430	cs	430								
				dw	1,031								
		Type III Tank space gain	1,617	total	4,066								
FY17	10/1/16	31	248	cs	248	202	331	36.3	5,895	180	10,753	67.10	10 and 11
		38	853	ds	2,302								
		42	150	cs	150								
		44	278	cs	278								
		46	260	cs	260								
				dw	858								
		Type III Tank space gain	1,789	total	4,096								
FY18	10/1/17	28	186	cs	186	198	325	30.8	6,255	180	11,390	73.37	11 and 12
		31	994	ds	2,683								
		42	250	cs	250								
		45	137	cs	137								
		49	250	cs	250								
				dw	900								
		Type III Tank space gain	1,817	total	4,406								
FY19	10/1/18	27	110	cs	110	199	326	34.9	6,505	180	11,832	79.90	12 and 13
		28	1,011	ds	2,731								
		29	300	cs	300								
		36	155	cs	155								
		41	300	cs	300								
		42	200	cs	200								
		49	100	cs	100								
				dw	646								
		Type III Tank space gain	2,176	total	4,542								
FY20	10/1/19	27	60	cs	60	198	324	41.7	6,429	180	11,698	86.35	13, 14 and 15
		29	300	cs	300								
		37	268	cs	268								
		42	200	cs	200								
		44	969	ds	2,617								
		49	300	cs	300								
				dw	774								
		Type III Tank space gain	1,897	total	4,519								

Appendix I.4 - Salt Solution Processing (Requirements Case)

SALT SOLUTION PROCESSING FACILITY									SALTSTONE FACILITY				
Fiscal Year	FY Start Date	Source Tank	Waste Removed (Kgal)	Feed Type	Salt Feed to Salt Processing (Kgal)	NaTPB Req'd (Kgal)	10 wt% ppt Feed to DWPF (Kgal)	Ppt Cs Conc (Ci/gal)	Salt Processing Filtrate to Grout (Kgal)	ETF Feed to Grout (Kgal)	Grout Produced (Kgal)	Cum Vault Cells Filled	Active Grout Vault #'s
FY21	10/1/20	27	48	cs	48	198	326	21.6	7,063	180	12,820	93.41	15 and 16
		29	600	cs	600								
		42	216	cs	216								
		45	1,107	ds	2,990								
		49	420	cs	420								
				dw	755								
	Type III Tank space gain		2,175	total	5,029								
FY22	10/1/21	25	286	cs	286	197	324	42.3	6,631	180	12,055	100.06	16 and 17
		30	65	ds	175								
		36	1,072	ds	2,895								
		49	264	cs	200								
		50	590	cs	590								
				dw	778								
	Type III Tank space gain		2,277	total	4,924								
FY23	10/1/22	27	160	cs	160	198	325	34.1	6,351	180	11,560	106.43	17 and 18
		37	954	ds	2,575								
		46	264	ds	714								
		50	630	cs	630								
				dw	641								
	Type III Tank space gain		2,008	total	4,720								
FY24	10/1/23	27	454	ds	1,225	79	252	8.8	3,468	180	6,457	109.99	18
		29	640	cs	640								
		41	430	cs	430								
		50	48	cs	48								
				dw	222								
	Type III Tank space gain		1,572	total	2,565								

Notes:
- Space gain refers to Type III tanks only and is equal to cs + ds (prior to dissolution)
- cs = concentrated supernate
- ds = dissolved salt cake
- dw = dilution water to bring salt feed to 6.44 [Na+] for feed to Salt Processing, additional dilution to 4.7 [Na+] is performed at the Salt Processing Facility.
- NaTPB = sodium tetraphenylborate
- Precipitate Cesium Ci/gal has not been adjusted for decay
- With a permanent roof, each cell measures 98.5 x 98.5 x 25 feet = 242,500 cu ft, and holds 1,814 kgal grout, or 1,025 kgal feed.
- Existing Vault #1 has 6 cells, of which 3 are already filled. Vault #4 has 12 cells, of which 1 is already filled. All new vaults will have six cells each.
- Vault # fill sequence is assumed to be 4, 1, 2, 3, 5, 6, 7, ... etc.

Appendix I.5 - Sludge Processing (Requirements Case)

	Waste Removal		ESP Pretreatment									DWPF Vitrification						
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
Sludge Batch	Source Tanks	Sludge Content (kg)	Alum. Rem'd (wt %)*	Alum. Dis. Start Date	Wash Start Date	Feed Prep Total Dur. (months)	Total ESP Water Vol. (kgal)	Na (wt% dry)*	Hg (wt% dry)*	Total Solids (wt%)*	Pretreated Volume (kgal)*	Feed Volume (kgal)	Start Feed	Canister Yield*	Feed Duration (years)	Finish Feed	Feed Tank	Waste Loading (wt %)*
1A	51	na	na	na	na	na	na	8.80		16.4	491	491	3/1/96	492	2.75	8/30/98	51	25.0
												-140	(Tk 51 heel @ 40 ")					
												351						
1B	42	420,861	na	na	na	na	na	7.77		16.5	460	460	10/1/98	600	2.75	6/30/01	51	25.0
	total	420,861											(Tk 51 heel @ 40 ")					
2	8	182,500	na	na	7/30/00	12	2,080	6.90		16.9	582	582	6/30/01	575	2.88	5/15/04	40	25.0
	40	167,100										-140	(Tk 40 heel @ 40 ")					
	total	349,600										442						
3	7 (70%)	288,960			4/15/03	23	2,590	6.90		16.5	670	670	5/15/04	622	3.11	6/24/07	51	28.8
	11	124,400	75	7/15/02														
	total	413,360																
4	4	65,480			2/22/06	27	3,670	8.90		16.5	651	651	6/24/07	555	2.77	4/1/10	40	29.8
	7 (30%)	123,840																
	15	165,800	50	4/24/05														
	18	20,740																
	19	2,794																
	total	378,654																
5	5	57,630			3/2/09	24	3,080	6.90		16.5	685	685	4/1/10	523	2.62	11/11/12	51	30.8
	6	38,710																
	13 (30%)	125,280	50	5/1/08														
	12	189,700	50															
	21	6,393																
	22	13,260																
	total	430,973																
6	13 (70%)	292,320	35	5/13/10	3/13/11	31	4,090	7.02		16.5	881	881	11/11/12	779	3.89	10/3/16	40	27.8
	23	59,110																
	26	154,900																
	total	506,330																
7	47	137,800			2/2/15	31	4,320	6.93	3.00	16.5	606	606	10/3/16	498	2.49	3/30/19	51	31.3
	32	195,600	86	4/4/14														
	33	62,400																
	total	395,800																
8	34	77,120			4/30/18	22	2,300	6.84	3.72	16.5	680	680	3/30/19	492	2.46	9/12/21	40	32.2
	35	139,000	61	6/29/17								140	(pump down Tk 40 heel to 0)					
	39	89,470	61									820						
	43	51,940																
	40 heel	72,000																
	total	429,530																

Appendix I.5 - Sludge Processing (Requirements Case)

	Waste Removal		ESP Pretreatment									DWPF Vitrification						
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
Sludge Batch	Source Tanks	Sludge Content (kg)	Alum. Rem'd (wt %)*	Alum. Dis. Start Date	Wash Start Date	Feed Prep Total Dur. (months)	Total ESP Water Vol. (kgal)	Na (wt% dry)*	Hg (wt% dry)*	Total Solids (wt%)*	Pretreated Volume (kgal)*	Feed Volume (kgal)	Start Feed	Canister Yield*	Feed Duration (years)	Finish Feed	Feed Tank	Waste Loading (wt %)*
9	51 heel	72,562			1/12/21	19	790	6.95	1.52	16.5	442	442	9/12/21	438	2.19	11/21/23	51	30.3
	1-3,9-10,36,41	20,316																
	42 heel	31,042	48	3/14/20														
	Type III's	187,871	48															
	total	311,791																
Totals							22,920					6,008		5,573	28			

Notes:

* General: As described in the text of the plan, several Source Tank changes have been made from Rev. 9 of the HLW System Plan due to the delay in Salt Processing. Insufficient time was available to run the CPES and PCCS models to fully assess the impact on the sludge batches from these Source Tank changes. It is expected that all changes can be accommodated with no significant impact on canister yields as shown above. Prior to the next revision of the HLW System Plan, all sludge batches will be run through the CPES and PCCS models for verification. For this revision of the plan, the numbers indicated with an * are the same as shown in Rev. 9 unless otherwise noted.

A) Each Sludge Batch must be individually tested and confirmed to meet waste qualification spedicfications

B) Sludge in these tanks will comprise the batch. Note: The sludge from Tanks 18&19 is now shown in Batch 4, however these tanks will be cleaned out earlier, with the sludge moved to Tk 7, to support FFA dates.

C) Amount of sludge from each source tank in the batch obtained from WCS data base

D) Amount of aluminum removed from HM sludge (typically H-Area HHW sludge) per CPES model

E) Aluminum dissolution start date for H-Area sludge in batch. Note: H-Area sludge must be in ESP tank 1 mo. prior to this date to allow for settling and decant of transfer water.

F) Start date of water washing of combined H- & F-Area sludge to obtain proper alkali composition of the sludge slurry. Note: F-Area sludge must be in ESP tank 1 mo. prior to this date.

G) Total planned duration of aluminum dissolution, washing, sampling, test glass production, and associated decants

H) Total volume of sludge transfer water, aluminum dissolution and wash water decants

I) Amount of total Na in washed sludge (dry basis)

J) Amount of total Hg in washed sludge (dry basis)

K) Total solids (soluble and insoluble) in washed sludge, normally adjusted to 16.5 wt%

L) Volume of sludge at given wt% total solids before heel effects (Batch 1B is actual. Batch 2 and beyond are based on ratio of Rev. 9 numbers with sludge kg values for new batch makeups)

M) Volume of sludge available for feed after adding or subtracting pump heel

N) Start feed date based on depletion of previous batch down to pump heel

O) Estimated number of canisters produced given the pretreatment as shown. Numbers have been adjusted from Rev. 9 based on Batch 1A operating data and feed availabilty changes as described in the text of this plan.

P) Column O divided by the planned canister production during the period in which the batch is vitrified

Q) Column N plus column P. Finish Feed means when the last transfer of feed is sent from the Feed Tank. The last canister for the batch will be poured later. The DWPF has approximately 25 canisters of feed in process. Therefore 25 more canisters will be produced from the batch after the last feed is sent to DWPF.

R) Batch feed tank

S) Weight % of glass comprised of sludge oxides. Numbers have been adjusted from Rev. 9 for Batch 1B and 2 based on Batch 1A operating data.

Appendix I.6 - Canister Storage (Requirements Case)

End of Year	SRS Cans Produced		SRS Cans In GWSB #1 (2,159 max)			SRS Cans In GWSB #2 2,286 -311 = 1975			SRS Cans Shipped to Repository		Net Cans Stored At SRS
	Yearly	Cum.	Added	Shipped	Cum.	Added	Shipped	Cum.	Each Year	Cumulative	
1996	64	64	64		64						64
1997	169	233	169		233						233
1998	250	483	250		483						483
1999	250	733	250		733						733
2000	200	933	200		933						933
2001	200	1,133	200		1,133						1,133
2002	200	1,333	200		1,333						1,333
2003	200	1,533	200		1,533						1,533
2004	200	1,733	200		1,733						1,733
2005	200	1,933	200		1,933	0		0			1,933
2006	200	2,133	200		2,133	0		0			2,133
2007	200	2,333	26		2,159	174		174			2,333
2008	200	2,533			2,159	200		374			2,533
2009	200	2,733			2,159	200		574			2,733
2010	200	2,933			2,159	200		774			2,933
2011	200	3,133			2,159	200		974			3,133
2012	200	3,333			2,159	200		1,174			3,333
2013	200	3,533			2,159	200		1,374			3,533
2014	200	3,733			2,159	200		1,574			3,733
2015	200	3,933		(500)	1,659	200	0	1,774	500	500	3,433
2016	200	4,133		(500)	1,159	200	0	1,974	500	1,000	3,133
2017	200	4,333	200		1,359		(500)	1,474	500	1,500	2,833
2018	200	4,533	200	0	1,559	0	(500)	974	500	2,000	2,533
2019	200	4,733	0	(500)	1,059	200	0	1,174	500	2,500	2,233
2020	200	4,933		(500)	559	200	0	1,374	500	3,000	1,933
2021	200	5,133		(500)	59	200	0	1,574	500	3,500	1,633
2022	200	5,333	200	0	259		(500)	1,074	500	4,000	1,333
2023	200	5,533	200		459		(500)	574	500	4,500	1,033
2024	41	5,574	0	(459)	0	41	(41)	574	500	5,000	574
2025	0	5,574		0	0	0	(500)	74	500	5,500	74
2026	0	5,574		0	0	0	(74)	0	74	5,574	0
2027											
2028											
2029											

Appendix I.6 - Canister Storage (Requirements Case)

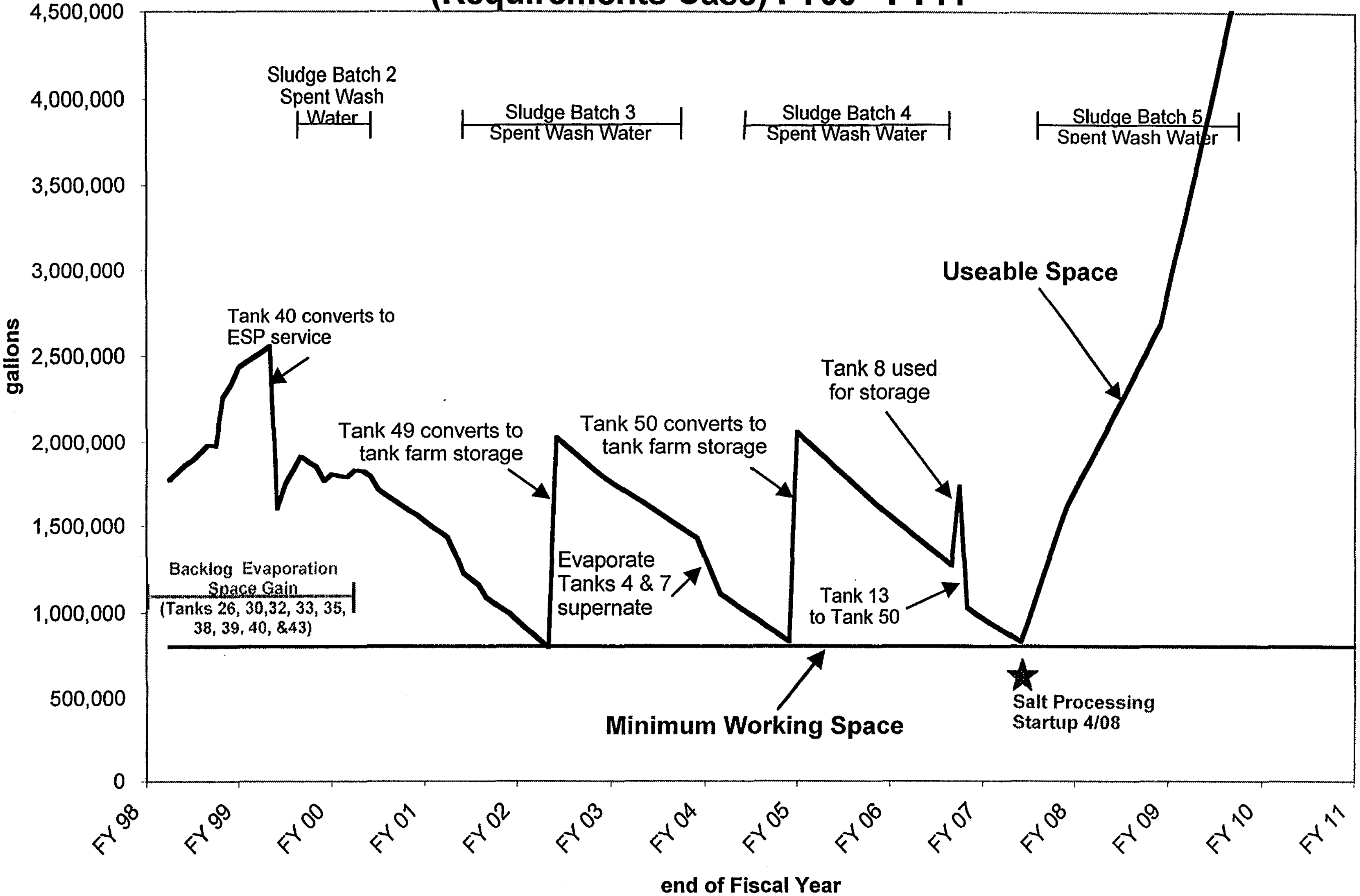
Notes:

1) GWSB #1 filling began in April 1996. It has 2,286 canister storage locations, less 122 locations for which the plugs cannot be repaired, less 5 positions being used for storage of non-radioactive test canisters = 2,159 usable storage locations. However, of the 2,159 usable positions, 450 locations are currently abandoned in place and will need repair/replacement plugs before they will be available for use.
2) GWSB#1 is expected to reach maximum capacity in FY07. Therefore, GWSB#2 must be ready to start operations in FY07.
3) GWSB#2 is sized to provide storage if the Canister shipment date is delayed by up to 2 years.
4) This System Plan assumes that canisters can be transported to the Federal Repository at a rate of 500 per year, starting in 2015.
5) A canister load-out facility will be required to move the canisters from the GWSB's to a truck or railcar. Assume one year for design (FY12) and two years for construction (FY13-14).
6) GWSB#1 will be emptied and available for D&D in FY24.
7) GWSB#2 will be emptied and available for D&D in FY26.
8) This System Plan does not include possible can-in-can disposition of excess plutonium.
9) This System Plan does not include possible storage of ~300 West Valley canisters at SRS.

Appendix I.7 – Near Term Saltstone Operations (Requirements Case)

FY	FY Start Date	Previous Year Tk 50 Inven. (Kgal)	ETF Conc (Kgal)	Material Fed to Saltstone (Kgal)	TK 50 Inventory (Kgal)	Grout Produced (Kgal)	Cum Vault Cells Filled	Active Vault #	Notes:
FY99	10/1/98	206 (as of 1/22/99)	120	0	326	0	3.50	---	3.2 cells already filled at the start of FY99. (3.0 cells in Vault 1 and 0.5 cells in Vault 4) Saltstone Facility in partial lay-up (not operating).
FY00	10/1/99	326	180	0	506	0	3.50	---	Saltstone Facility in partial lay-up (not operating).
FY01	10/1/00	506	180	0	686	0	3.50	---	Saltstone Facility in partial lay-up (not operating).
FY02	10/1/01	686	180	0	866	0	3.50	---	Saltstone Facility in partial lay-up (not operating).
FY03	10/1/02	866	180	0	1,046	0	3.50	---	Saltstone Facility in partial lay-up (not operating).
FY04	10/1/03	1,046	180	(1,226)	0	2,170	4.70	4	Saltstone Facility operates to de-inventory Tank 50.
FY05	10/1/04	0	180	(180)	0	319	4.87	4	Saltstone Facility operates as required to support ETF. Tank 50 mods required for return to waste storage by FY06
FY06	10/1/05	0	180	(180)	0	319	5.05	4	Saltstone Facility operates as required to support ETF.
FY07	10/1/06	0	180	(180)	0	319	5.22	4	Saltstone Facility operates as required to support ETF.
FY08	10/1/07	0	180	(180)	0	319	5.40	4	Saltstone Facility operates as required to support ETF.

Appendix I.8 - Useable Tank Space (Requirements Case) FY00 - FY11



Appendix J.1 Funding (Target Case)

Budget Authority in Escalated Dollars

Project	Title	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14
HL-01	**H Tank Farm**																
	H Tank Farm Operations	84,057	87,851	94,844	95,392	98,561	100,612	101,450	104,189	107,002	109,891	119,644	120,830	124,093	124,560	126,442	129,856
	LI: Replacement Evap	9,418	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-01 Total	**93,474**	**87,851**	**94,844**	**95,392**	**98,561**	**100,612**	**101,450**	**104,189**	**107,002**	**109,891**	**119,644**	**120,830**	**124,093**	**124,560**	**126,442**	**129,856**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-02	**F Tank Farm**	**57,762**	**60,737**	**61,349**	**62,330**	**64,606**	**65,741**	**65,637**	**67,409**	**69,229**	**71,099**	**80,204**	**79,975**	**80,730**	**82,910**	**85,148**	**73,761**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-03	**Waste Removal & Tank Closures**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	2,257	1,943	-	-	-	-	-	-	-	4,094	8,408	17,964	34,063	32,269	14,030	19,212
	WR: Tank Closure	636	-	-	-	-	-	-	-	-	-	-	1,268	11,241	19,821	18,106	19,104
	HL-03 Total	**2,893**	**1,943**	-	-	-	-	-	-	-	**4,094**	**8,408**	**19,232**	**45,305**	**52,090**	**32,137**	**38,316**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	**57,379**	**58,446**	**45,395**	**44,774**	**45,983**	**47,225**	**48,500**	**49,809**	**51,154**	**52,535**	**78,253**	**72,461**	**74,417**	**76,426**	**78,490**	**80,609**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-05	**Vitrification**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vitrification Ops	133,962	126,614	84,030	85,218	86,332	85,003	87,298	89,656	141,438	200,668	219,238	181,401	182,832	190,064	198,026	198,172
	Failed Equip. Stor. Vaults	-	-	-	-	-	-	-	-	988	2,571	569	-	-	1,180	2,967	571
	HL-05 Total	**133,962**	**126,614**	**84,030**	**85,218**	**86,332**	**85,003**	**87,298**	**89,656**	**142,426**	**203,239**	**219,807**	**181,401**	**182,832**	**191,244**	**200,993**	**198,743**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-06	**Glass Waste Storage**	**494**	**368**	**362**	**357**	**367**	**376**	**387**	**397**	**408**	**419**	**430**	**6,099**	**34,231**	**50,202**	**47,272**	**32,656**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-13	**Salt Disposition**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Salt Disposition Ops	13,624	42,129	36,681	-	-	-	-	-	-	-	-	35,421	71,541	73,473	75,554	77,494
	LI: Salt Alternative	-	-	78,327	121,500	123,600	126,628	132,740	139,452	174,972	171,105	115,010	46,160	-	-	-	-
	HL-13 Total	**13,624**	**42,129**	**115,008**	**121,500**	**123,600**	**126,628**	**132,740**	**139,452**	**174,972**	**171,105**	**115,010**	**81,581**	**71,541**	**73,473**	**75,554**	**77,494**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	**1,590**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-10	**LI: Storm Water Upgrades**	**2,044**	**4,430**	**249**	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-11	**LI: Tk Fm Services Upgrade II**	**1,390**	**4,314**	**9,118**	**6,217**	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-12	**LI: Waste Removal**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	LI: WR from Tanks	25,127	14,134	(0)	-	1,089	1,118	1,957	10,657	22,157	49,686	57,802	60,610	63,473	49,686	60,638	75,028
	LI: Vit Upgrades	-	299	(0)	-	-	-	-	-	55,771	114,554	88,235	30,206	-	-	-	-
	LI: Pipe, Evaps & Infras.	-	-	936	6,191	10,191	11,324	4,326	-	9,959	20,456	21,008	-	-	-	-	-
	HL-12 Total	**25,127**	**14,433**	**935**	**6,191**	**11,280**	**12,442**	**6,283**	**10,657**	**87,887**	**184,696**	**167,046**	**90,816**	**63,473**	**49,686**	**60,638**	**75,028**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FA-24	**Facility Decontamination and Decommissioni**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HLW TOTAL	**389,739**	**401,265**	**411,291**	**421,979**	**430,728**	**438,027**	**442,295**	**461,569**	**633,079**	**797,077**	**788,802**	**652,395**	**676,621**	**700,590**	**706,674**	**706,462**
Support	**Facilities**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CIF Operations	23,652	26,045	27,792	32,916	34,131	35,042	34,625	34,642	35,878	34,769	36,893	35,779	35,326	36,684	39,125	38,161
	ETF Operations	16,509	17,580	21,715	19,955	19,690	20,155	20,743	23,240	22,290	23,932	24,411	26,850	24,307	26,743	26,077	26,329
	Saltstone Operations	1,489	1,222	1,778	2,795	8,135	11,643	10,561	10,846	10,482	10,765	11,055	24,109	44,167	45,870	46,146	45,304
	SW TOTAL	41,650	44,847	51,285	55,666	61,956	66,840	65,929	68,729	68,650	69,465	72,359	86,739	103,800	109,298	111,348	109,795
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Life Cycle Cost	**431,389**	**446,112**	**462,576**	**477,645**	**492,684**	**504,868**	**508,224**	**530,297**	**701,728**	**866,543**	**861,161**	**739,134**	**780,421**	**809,887**	**818,022**	**816,257**

Note: FY00 is the President's Budget which has a funding allocation based on production of 100 canisters in FY00. Since then, SRS has committed to produce 200 canisters in FY00, which will require a re-distribution of funding among the PBS's.

Appendix J.1 Funding (Target Case)

Budget Authority in Escalated Dol

Project	Title	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
HL-01	**H Tank Farm**														
	H Tank Farm Operations	133,362	135,359	137,366	139,384	120,561	123,816	83,179	85,425	87,732	88,115	88,456	88,751	91,147	72,630
	LI: Replacement Evap	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-01 Total	**133,362**	**135,359**	**137,366**	**139,384**	**120,561**	**123,816**	**83,179**	**85,425**	**87,732**	**88,115**	**88,456**	**88,751**	**91,147**	**72,630**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-02	**F Tank Farm**	**75,752**	**77,798**	**76,604**	**76,980**	**77,321**	**49,076**	**48,568**	**47,998**	**47,361**	**48,640**	**49,953**	**47,115**	**48,387**	**47,485**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-03	**Waste Removal & Tank Closures**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	19,731	20,264	26,014	26,716	21,950	16,907	17,363	17,832	18,314	18,808	19,316	13,225	13,582	-
	WR: Tank Closure	7,107	8,780	34,455	63,911	59,541	70,044	60,029	10,090	10,390	10,671	18,314	26,468	40,378	45,152
	HL-03 Total	**26,838**	**29,044**	**60,469**	**90,627**	**81,491**	**86,950**	**77,393**	**27,922**	**28,704**	**29,479**	**37,630**	**39,693**	**53,960**	**45,152**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	**82,786**	**85,021**	**87,316**	**89,674**	**92,095**	**94,582**	**97,135**	**99,758**	**102,452**	**105,218**	**108,059**	**110,976**	**113,973**	**117,050**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-05	**Vitrification**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vitrification Ops	207,196	208,872	217,371	226,058	226,461	236,660	238,618	248,577	258,059	258,849	270,299	272,603	284,236	294,592
	Failed Equip. Stor. Vaults	-	-	1,381	3,401	607	-	-	1,611	3,905	641	-	-	1,878	4,493
	HL-05 Total	**207,196**	**208,872**	**218,753**	**229,459**	**227,067**	**236,660**	**238,618**	**250,188**	**261,963**	**259,490**	**270,299**	**272,603**	**286,114**	**299,085**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-06	**Glass Waste Storage**	**5,425**	**5,572**	**5,722**	**5,877**	**6,036**	**6,198**	**6,366**	**6,538**	**6,714**	**6,896**	**7,082**	**7,273**	**7,469**	**7,671**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-13	**Salt Disposition**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Salt Disposition Ops	79,793	81,629	83,833	86,096	88,421	91,281	92,896	96,276	98,108	101,151	104,557	91,580	83,662	89,430
	LI: Salt Alternative	-	-	47,200	64,632	49,783	-	-	-	-	-	-	-	-	-
	HL-13 Total	**79,793**	**81,629**	**131,032**	**150,728**	**138,204**	**91,281**	**92,896**	**96,276**	**98,108**	**101,151**	**104,557**	**91,580**	**83,662**	**89,430**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-10	**LI: Storm Water Upgrades**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-11	**LI: Tk Fm Services Upgrade II**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-12	**LI: Waste Removal**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	LI: WR from Tanks	91,632	101,168	81,523	76,869	76,862	40,475	50,234	53,603	60,212	44,669	59,987	15,286	25,259	8,985
	LI: Vit Upgrades	-	-	14,343	22,096	15,128	23,305	23,934	24,580	16,829	17,284	-	-	-	-
	LI: Pipe, Evaps & Infras.	-	-	-	40,051	82,266	63,365	21,692	-	-	-	-	-	-	-
	HL-12 Total	**91,632**	**101,168**	**95,867**	**139,016**	**174,256**	**127,145**	**95,861**	**78,183**	**77,041**	**61,953**	**59,987**	**15,286**	**25,259**	**8,985**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
FA-24	**Facility Decontamination and Decommissioni**	**42,207**	**35,465**	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HLW TOTAL	**744,991**	**759,927**	**813,130**	**921,744**	**917,031**	**815,708**	**740,016**	**692,288**	**710,074**	**700,941**	**726,022**	**673,277**	**709,971**	**687,489**
Support	**Facilities**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CIF Operations	39,898	45,151	41,538	43,587	47,919	44,278	45,539	51,598	47,950	48,479	51,367	51,546	54,055	55,731
	ETF Operations	28,643	29,082	31,926	33,493	32,226	34,583	32,080	32,947	35,850	34,543	33,989	34,907	35,849	36,817
	Saltstone Operations	47,952	67,724	53,217	51,006	55,884	52,835	61,901	60,089	53,622	69,438	25,608	31,954	17,059	19,622
	SW TOTAL	116,493	141,957	126,682	128,086	136,030	131,696	139,521	144,634	137,422	152,460	110,964	118,407	106,964	112,170
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Life Cycle Cost	**861,485**	**901,884**	**939,812**	**1,049,830**	**1,053,060**	**947,404**	**879,537**	**836,922**	**847,496**	**853,401**	**836,986**	**791,684**	**816,935**	**799,659**

Appendix J.1 Funding (Target Case)

Budget Authority in Escalated Dol

Project	Title	FY29	FY30	FY31	FY32	FY33	FY34	FY35	Cumulative FY99-End
HL-01	**H Tank Farm**								
	H Tank Farm Operations	74,591	76,605	78,674	75,885	47,660	-	-	3,557,971
	LI: Replacement Evap	-	-	-	-	-	-	-	9,418
	HL-01 Total	**74,591**	**76,605**	**78,674**	**75,885**	**47,660**	-	-	**3,567,389**
		-	-	-	-	-	-	-	-
HL-02	**F Tank Farm**	**38,562**	**39,603**	**19,145**	**19,662**	**20,193**	-	-	**2,084,830**
		-	-	-	-	-	-	-	-
HL-03	**Waste Removal & Tank Closures**	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	-	-	-	-	-	-	-	384,263
	WR: Tank Closure	14,754	15,621	60,926	63,353	107,622	112,060	23,331	933,173
	HL-03 Total	**14,754**	**15,621**	**60,926**	**63,353**	**107,622**	**112,060**	**23,331**	**1,317,436**
		-	-	-	-	-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	**120,210**	**123,456**	**63,395**	-	-	-	-	**2,655,010**
		-	-	-	-	-	-	-	-
HL-05	**Vitrification**	-	-	-	-	-	-	-	-
	Vitrification Ops	310,401	295,652	294,473	299,047	77,647	-	-	7,015,625
	Failed Equip. Stor. Vaults	663	-	-	-	-	-	-	27,426
	HL-05 Total	**311,064**	**295,652**	**294,473**	**299,047**	**77,647**	-	-	**7,043,051**
		-	-	-	-	-	-	-	-
HL-06	**Glass Waste Storage**	**7,878**	**8,091**	**8,309**	**8,534**	**7,959**	-	-	**306,433**
		-	-	-	-	-	-	-	-
HL-13	**Salt Disposition**	-	-	-	-	-	-	-	-
	Salt Disposition Ops	87,641	90,932	92,754	95,096	-	-	-	2,061,050
	LI: Salt Alternative	-	-	-	-	-	-	-	1,391,110
	HL-13 Total	**87,641**	**90,932**	**92,754**	**95,096**	-	-	-	**3,452,160**
		-	-	-	-	-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	-	-	-	-	-	-	-	**1,590**
HL-10	**LI: Storm Water Upgrades**	-	-	-	-	-	-	-	**6,723**
HL-11	**LI: Tk Fm Services Upgrade II**	-	-	-	-	-	-	-	**21,039**
		-	-	-	-	-	-	-	-
HL-12	**LI: Waste Removal**	-	-	-	-	-	-	-	-
	LI: WR from Tanks	37	3,788	17,453	23,615	22,024	19,869	-	1,366,712
	LI: Vit Upgrades	-	-	-	-	-	-	-	446,565
	LI: Pipe, Evaps & Infras.	-	-	-	-	-	-	-	291,765
	HL-12 Total	**37**	**3,788**	**17,453**	**23,615**	**22,024**	**19,869**	-	**2,105,042**
		-	-	-	-	-	-	-	-
FA-24	**Facility Decontamination and Decommissioni**	-	-	-	**2,112**	**304,908**	**374,185**	-	**758,878**
		-	-	-	-	-	-	-	-
	HLW TOTAL	**654,737**	**653,748**	**635,128**	**587,304**	**588,014**	**506,114**	**23,331**	**23,319,580**
Support	**Facilities**	-	-	-	-	-	-	-	-
	CIF Operations	55,818	57,032	60,425	62,106	20,014	-	-	1,465,493
	ETF Operations	37,811	38,832	39,881	40,958	9,166	-	-	994,109
	Saltstone Operations	19,474	20,282	20,710	23,821	5,793	-	-	1,044,359
	SW TOTAL	113,103	116,146	121,015	126,885	34,973	-	-	3,503,961
		-	-	-	-	-	-	-	-
	Life Cycle Cost	767,840	769,894	756,143	714,189	622,986	506,114	23,331	26,823,542

Appendix J.1 Funding (Target Case)

Budget Authority in Constant Dollars

Project	Title	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14
HL-01	**H Tank Farm**																
	H Tank Farm Operations	84,057	84,798	88,367	86,541	87,065	86,541	84,967	84,967	84,967	84,967	90,075	88,577	88,577	86,573	85,571	85,571
	LI: Replacement Evap	9,418	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-01 Total	**93,474**	**84,798**	**88,367**	**86,541**	**87,065**	**86,541**	**84,967**	**84,967**	**84,967**	**84,967**	**90,075**	**88,577**	**88,577**	**86,573**	**85,571**	**85,571**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-02	**F Tank Farm**	**57,762**	**58,626**	**57,160**	**56,546**	**57,071**	**56,546**	**54,973**	**54,973**	**54,973**	**54,973**	**60,383**	**58,627**	**57,625**	**57,625**	**57,625**	**48,606**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-03	**Waste Removal & Tank Closures**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	2,257	1,875	-	-	-	-	-	-	-	3,165	6,330	13,169	24,314	22,428	9,495	12,660
	WR: Tank Closure	636	-	-	-	-	-	-	-	-	-	-	930	8,024	13,776	12,254	12,589
	HL-03 Total	**2,893**	**1,875**	-	-	-	-	-	-	-	**3,165**	**6,330**	**14,099**	**32,338**	**36,204**	**21,749**	**25,249**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	**57,379**	**56,415**	**42,295**	**40,620**	**40,620**	**40,620**	**40,620**	**40,620**	**40,620**	**40,620**	**58,914**	**53,119**	**53,119**	**53,119**	**53,119**	**53,119**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-05	**Vitrification**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vitrification Ops	133,962	122,214	78,291	77,311	76,262	73,115	73,115	73,115	112,311	155,155	165,056	132,980	130,506	132,101	134,016	130,589
	Failed Equip. Stor. Vaults	-	-	-	-	-	-	-	-	785	1,988	429	-	-	820	2,008	376
	HL-05 Total	**133,962**	**122,214**	**78,291**	**77,311**	**76,262**	**73,115**	**73,115**	**73,115**	**113,096**	**157,143**	**165,485**	**132,980**	**130,506**	**132,921**	**136,024**	**130,965**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-06	**Glass Waste Storage**	**494**	**355**	**337**	**324**	**324**	**324**	**324**	**324**	**324**	**324**	**324**	**4,471**	**24,434**	**34,892**	**31,992**	**21,519**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-13	**Salt Disposition**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Salt Disposition Ops	13,624	40,665	34,176	-	-	-	-	-	-	-	-	25,966	51,066	51,066	51,132	51,066
	LI: Salt Alternative	-	-	72,978	110,227	109,184	108,918	111,174	113,724	138,939	132,297	86,587	33,839	-	-	-	-
	HL-13 Total	**13,624**	**40,665**	**107,154**	**110,227**	**109,184**	**108,918**	**111,174**	**113,724**	**138,939**	**132,297**	**86,587**	**59,805**	**51,066**	**51,066**	**51,132**	**51,066**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	**1,590**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-10	**LI: Storm Water Upgrades**	**2,044**	**4,276**	**232**	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-11	**LI: Tk Fm Services Upgrade II**	**1,390**	**4,164**	**8,496**	**5,640**	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-12	**LI: Waste Removal**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	LI: WR from Tanks	25,127	13,643	(0)	-	962	962	1,639	8,691	17,594	38,417	43,517	44,432	45,307	34,533	41,037	49,441
	LI: Vit Upgrades	-	289	(0)	-	-	-	-	-	44,286	88,572	66,429	22,143	-	-	-	-
	LI: Pipe, Evaps & Infras.	-	-	872	5,617	9,003	9,740	3,623	-	7,908	15,816	15,816	-	-	-	-	-
	HL-12 Total	**25,127**	**13,931**	**871**	**5,617**	**9,964**	**10,701**	**5,262**	**8,691**	**69,789**	**142,805**	**125,763**	**66,575**	**45,307**	**34,533**	**41,037**	**49,441**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FA-24	**Facility Decontamination and Decommissioni**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HLW TOTAL	**389,739**	**387,321**	**383,204**	**382,825**	**380,489**	**376,765**	**370,434**	**376,413**	**502,708**	**616,294**	**593,861**	**478,253**	**482,972**	**486,933**	**478,249**	**465,536**
Support	**Facilities**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CIF Operations	23,652	25,140	25,894	29,862	30,150	30,141	29,000	28,251	28,489	26,883	27,775	26,229	25,216	25,497	26,478	25,147
	ETF Operations	16,509	16,969	20,232	18,103	17,394	17,336	17,373	18,953	17,700	18,504	18,378	19,683	17,350	18,587	17,648	17,350
	Saltstone Operations	1,489	1,180	1,657	2,536	7,186	10,015	8,845	8,845	8,323	8,323	8,323	17,673	31,526	31,881	31,230	29,854
	SW TOTAL	41,650	43,289	47,782	50,501	54,729	57,492	55,217	56,049	54,512	53,710	54,477	63,586	74,092	75,965	75,356	72,352
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Life Cycle Cost	**431,389**	**430,610**	**430,987**	**433,327**	**435,219**	**434,257**	**425,651**	**432,462**	**557,220**	**670,004**	**648,338**	**541,838**	**557,064**	**562,899**	**553,605**	**537,888**

Note: FY00 is the President's Budget which has a funding allocation based on production of 100 canisters in FY00. Since then, SRS has committed to produce 200 canisters in FY00, which will require a re-distribution of funding among the PBS's.

Appendix J.1 Funding (Target Case)

Budget Authority in Constant Doll

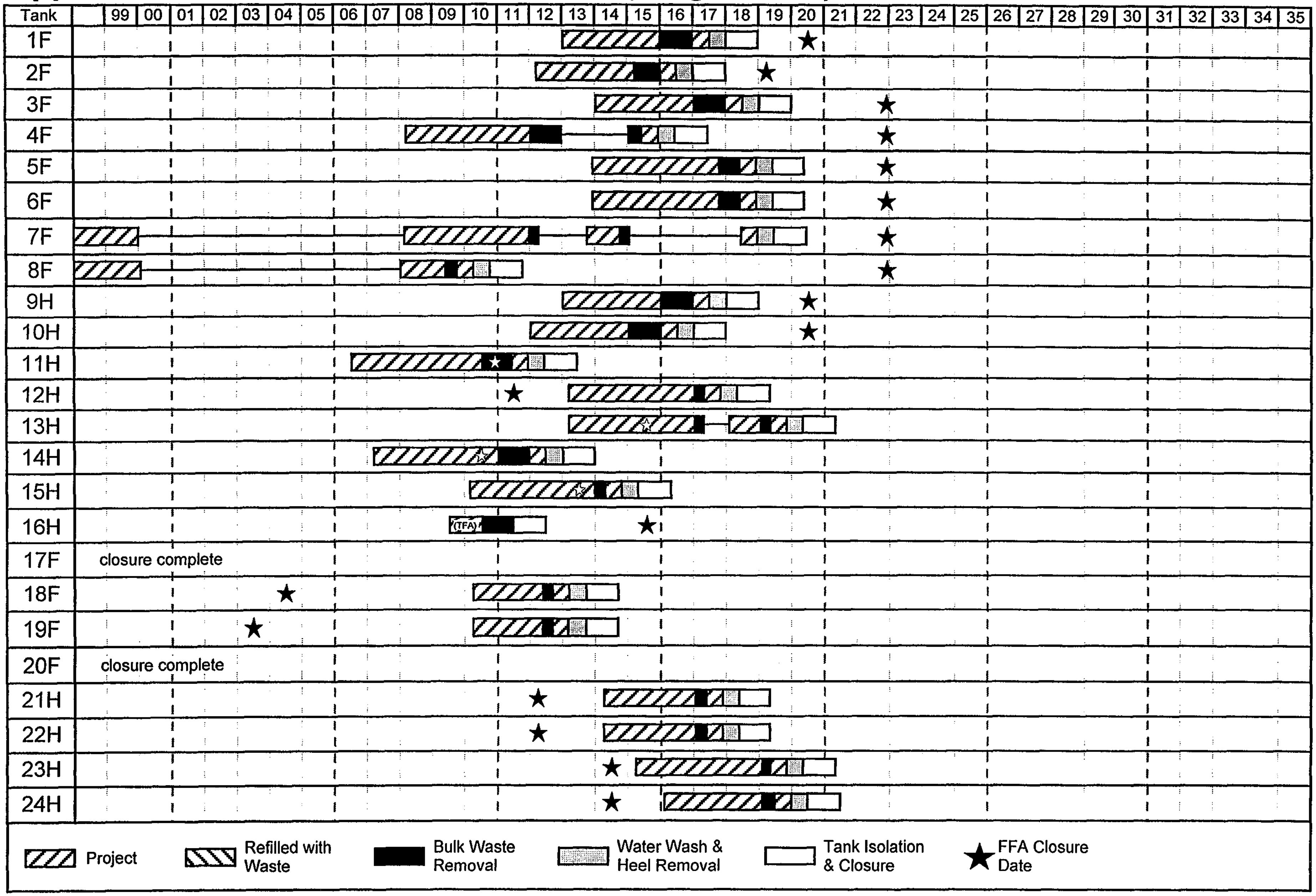
Project	Title	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
HL-01	**H Tank Farm**														
	H Tank Farm Operations	85,571	84,569	83,567	82,565	69,537	69,537	45,487	45,487	45,487	44,485	43,483	42,481	42,481	32,961
	LI: Replacement Evap	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HL-01 Total	**85,571**	**84,569**	**83,567**	**82,565**	**69,537**	**69,537**	**45,487**	**45,487**	**45,487**	**44,485**	**43,483**	**42,481**	**42,481**	**32,961**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-02	**F Tank Farm**	**48,606**	**48,606**	**46,602**	**45,600**	**44,598**	**27,562**	**26,560**	**25,558**	**24,556**	**24,556**	**24,556**	**22,551**	**22,551**	**21,549**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-03	**Waste Removal & Tank Closures**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	12,660	12,660	15,825	15,825	12,660	9,495	9,495	9,495	9,495	9,495	9,495	6,330	6,330	-
	WR: Tank Closure	4,560	5,485	20,961	37,858	34,342	39,338	32,827	5,373	5,387	5,387	9,003	12,669	18,819	20,491
	HL-03 Total	**17,220**	**18,146**	**36,786**	**53,683**	**47,003**	**48,833**	**42,323**	**14,868**	**14,882**	**14,882**	**18,498**	**18,999**	**25,149**	**20,491**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-04	**Feed Preparations & Sludge Operations**	**53,119**	**53,119**	**53,119**	**53,119**	**53,119**	**53,119**	**53,119**	**53,119**	**53,119**	**53,119**	**53,119**	**53,119**	**53,119**	**53,119**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-05	**Vitrification**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vitrification Ops	132,946	130,498	132,238	133,907	130,619	132,913	130,489	132,361	133,798	130,679	132,872	130,482	132,473	133,690
	Failed Equip. Stor. Vaults	-	-	840	2,015	350	-	-	858	2,025	324	-	-	875	2,039
	HL-05 Total	**132,946**	**130,498**	**133,078**	**135,921**	**130,969**	**132,913**	**130,489**	**133,219**	**135,822**	**131,003**	**132,872**	**130,482**	**133,349**	**135,729**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-06	**Glass Waste Storage**	**3,481**	**3,481**	**3,481**	**3,481**	**3,481**	**3,481**	**3,481**	**3,481**	**3,481**	**3,481**	**3,481**	**3,481**	**3,481**	**3,481**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-13	**Salt Disposition**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Salt Disposition Ops	51,199	51,000	51,000	51,000	51,000	51,265	50,801	51,265	50,867	51,066	51,398	43,835	38,992	40,584
	LI: Salt Alternative	-	-	28,714	38,285	28,714	-	-	-	-	-	-	-	-	-
	HL-13 Total	**51,199**	**51,000**	**79,714**	**89,285**	**79,714**	**51,265**	**50,801**	**51,265**	**50,867**	**51,066**	**51,398**	**43,835**	**38,992**	**40,584**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-09	**LI: Tk Fm Services Upgrade I**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-10	**LI: Storm Water Upgrades**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-11	**LI: Tk Fm Services Upgrade II**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
HL-12	**LI: Waste Removal**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	LI: WR from Tanks	58,795	63,207	49,595	45,534	44,333	22,732	27,471	28,542	31,218	22,551	29,488	7,317	11,772	4,078
	LI: Vit Upgrades	-	-	8,726	13,089	8,726	13,089	13,089	13,089	8,726	8,726	-	-	-	-
	LI: Pipe, Evaps & Infras.	-	-	-	23,725	47,449	35,587	11,862	-	-	-	-	-	-	-
	HL-12 Total	**58,795**	**63,207**	**58,320**	**82,347**	**100,508**	**71,407**	**52,422**	**41,631**	**39,944**	**31,277**	**29,488**	**7,317**	**11,772**	**4,078**
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
FA-24	**Facility Decontamination and Decommissioni**	**27,082**	**22,158**	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HLW TOTAL	**478,019**	**474,784**	**494,667**	**546,001**	**528,928**	**458,117**	**404,681**	**368,628**	**368,158**	**353,868**	**356,894**	**322,265**	**330,895**	**311,992**
Support	**Facilities**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CIF Operations	25,601	28,209	25,270	25,819	27,639	24,867	24,903	27,475	24,861	24,474	25,251	24,673	25,193	25,291
	ETF Operations	18,378	18,170	19,422	19,840	18,587	19,422	17,543	17,543	18,587	17,439	16,708	16,708	16,708	16,708
	Saltstone Operations	30,768	42,312	32,375	30,214	32,233	29,673	33,851	31,996	27,802	35,056	12,588	15,295	7,951	8,905
	SW TOTAL	74,747	88,691	77,067	75,872	78,460	73,963	76,297	77,014	71,250	76,969	54,547	56,676	49,853	50,905
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Life Cycle Cost	**552,767**	**563,475**	**571,734**	**621,873**	**607,387**	**532,080**	**480,978**	**445,642**	**439,409**	**430,837**	**411,441**	**378,941**	**380,747**	**362,897**

Appendix J.1 Funding (Target Case)

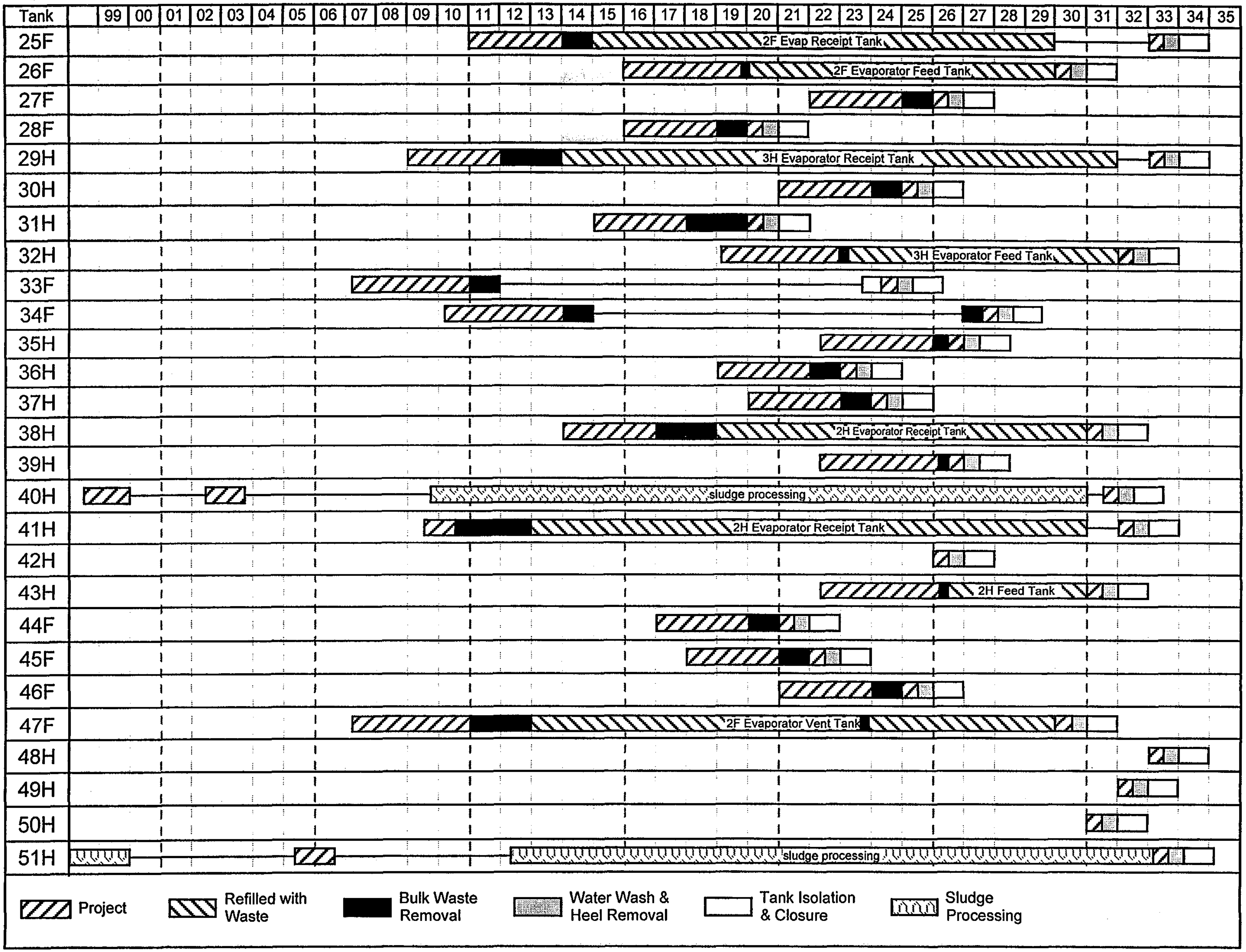
Budget Authority in Constant Doll

Project	Title	FY29	FY30	FY31	FY32	FY33	FY34	FY35	Cumulative FY99-End
HL-01	H Tank Farm								
	H Tank Farm Operations	32,961	32,961	32,961	30,956	18,931	-	-	2,348,648
	LI: Replacement Evap	-	-	-	-	-	-	-	9,418
	HL-01 Total	32,961	32,961	32,961	30,956	18,931	-	-	2,358,066
		-	-	-	-	-	-	-	-
HL-02	F Tank Farm	17,040	17,040	8,021	8,021	8,021	-	-	1,416,247
		-	-	-	-	-	-	-	-
HL-03	Waste Removal & Tank Closures	-	-	-	-	-	-	-	-
	WR Ops w/ Demo Projs	-	-	-	-	-	-	-	234,958
	WR: Tank Closure	6,519	6,721	25,525	25,844	42,749	43,342	8,787	460,196
	HL-03 Total	6,519	6,721	25,525	25,844	42,749	43,342	8,787	695,154
		-	-	-	-	-	-	-	-
HL-04	Feed Preparations & Sludge Operations	53,119	53,119	26,559	-	-	-	-	1,641,398
		-	-	-	-	-	-	-	-
HL-05	Vitrification	-	-	-	-	-	-	-	-
	Vitrification Ops	137,161	127,209	123,371	121,994	30,843	-	-	4,190,644
	Failed Equip. Stor. Vaults	293	-	-	-	-	-	-	16,023
	HL-05 Total	137,454	127,209	123,371	121,994	30,843	-	-	4,206,667
		-	-	-	-	-	-	-	0
HL-06	Glass Waste Storage	3,481	3,481	3,481	3,481	3,162	-	-	186,908
		-	-	-	-	-	-	-	-
HL-13	Salt Disposition	-	-	-	-	-	-	-	0
	Salt Disposition Ops	38,727	39,125	38,860	38,793	-	-	-	1,159,535
	LI: Salt Alternative	-	-	-	-	-	-	-	1,113,580
	HL-13 Total	38,727	39,125	38,860	38,793	-	-	-	2,273,115
		-	-	-	-	-	-	-	0
HL-09	LI: Tk Fm Services Upgrade I	-	-	-	-	-	-	-	1,590
HL-10	LI: Storm Water Upgrades	-	-	-	-	-	-	-	6,553
HL-11	LI: Tk Fm Services Upgrade II	-	-	-	-	-	-	-	19,690
		-	-	-	-	-	-	-	-
HL-12	LI: Waste Removal	-	-	-	-	-	-	-	-
	LI: WR from Tanks	16	1,630	7,312	9,634	8,748	7,685	-	846,959
	LI: Vit Upgrades	-	-	-	-	-	-	-	308,976
	LI: Pipe, Evaps & Infras.	-	-	-	-	-	-	-	187,019
	HL-12 Total	16	1,630	7,312	9,634	8,748	7,685	-	1,342,953
		-	-	-	-	-	-	-	-
FA-24	Facility Decontamination and Decommissioni	-	-	-	862	121,114	144,725	-	315,940
		-	-	-	-	-	-	-	-
	HLW TOTAL	289,318	281,286	266,090	239,585	233,568	195,751	8,787	14,464,281
Support	Facilities	-	-	-	-	-	-	-	-
	CIF Operations	24,665	24,539	25,315	25,336	7,950	-	-	901,136
	ETF Operations	16,708	16,708	16,708	16,708	3,641	-	-	610,309
	Saltstone Operations	8,605	8,727	8,676	9,718	2,301	-	-	617,932
	SW TOTAL	49,978	49,974	50,700	51,762	13,892	-	-	2,129,376
		-	-	-	-	-	-	-	-
	Life Cycle Cost	339,296	331,260	316,790	291,347	247,460	195,751	8,787	16,593,657

Appendix J.2 Waste Removal Schedule (Target Case)



Appendix J.2 Waste Removal Schedule (Target Case)



Appendix J.3 – Tank Farm Material Balance (Target Case)

End of Mo/Yr	Influents (gal) F Canyon LHW	F Canyon HHW	H Canyon LHW	H Canyon HHW	DWPF Recycle Sludge	DWPF Recycle Salt	ESP WW	Tank WW	Other	Backlog Tk	Backlog Volume (gal)	SGF	Ev	Type I & III Tanks Reused (kgal) Tk	Volume	Effluents (gal) 2F Evap	2H Evap	RHLWE	Salt Proc.	Other	Usable Space (gal)	Notes
Jan-99																					1,769,318	Actual inventory (Ref. Date Jan 22)
Feb-99	17,500	1,800	30,000		186,369				37,667	26,32,43	200,000	0.40	2F/2H			75,003	245,399				1,816,384	
Mar-99	27,500	1,800	40,000		186,369				37,667	26,32,43	200,000	0.40	2F/2H			82,103	252,499				1,857,650	
Apr-99	45,500	1,800	45,000		186,369				37,667	26,32,43	200,000	0.40	2F/2H			94,883	256,049				1,892,246	
May-99	27,500	1,800	30,000		186,369				37,667	26,32,43	200,000	0.40	2F/2H			82,103	245,399				1,936,412	
Jun-99	10,500	1,800	30,000		186,369				37,667	26,32,43	190,000	0.40	2F/2H			65,033	245,399				1,980,509	
Jul-99	27,500	1,800	30,000		186,369				37,667	43	100,000	0.30	2H			32,103	245,399				1,974,675	
Aug-99	10,500	1,800	30,000		186,369				37,667	33,35,38	512,000	0.62	2F/2H			277,053	276,899				2,262,291	
Sep-99	27,500	1,800	16,000		186,369				37,667	35	200,000	0.64	2F			160,103	205,459			(21,240)	2,337,277	Tank 22 fed to 2H Evaporator
FY99	194,000	14,400	251,000		1,490,952				301,333		1,802,000					868,384	1,972,500			(21,240)		
Oct-99	10,500	1,800	36,000		163,374				37,667	35	200,000	0.64	2F			148,033	162,204	36,759			2,434,932	
Nov-99	27,500	1,800	30,000		163,374				37,667	35	100,000	0.64	2F			96,103	157,944	36,759			2,465,398	
Dec-99	10,500	1,800	30,000		163,374				37,667	30	200,000	0.30	RE			20,033	157,944	96,759			2,496,794	
Jan-00	27,500	1,800	30,000		163,374				37,667	30	200,000	0.30	RE			32,103	157,944	96,759			2,523,259	
Feb-00	10,500	1,800	30,000		163,374				37,667	30	200,000	0.30	RE			20,033	157,944	96,759			2,554,655	
Mar-00	27,500	1,800	30,000		163,374				37,667	30&39	400,000	0.44	RE			32,103	157,944	212,759			2,697,120	
Apr-00	10,500	1,800	30,000		163,374				37,667	30&39	400,000	0.44	RE			20,033	157,944	212,759			2,844,516	
May-00	27,500	1,800	30,000		163,374				37,667	39	200,000	0.57	RE			32,103	157,944	150,759			2,924,982	
Jun-00	10,500	1,800	30,000		163,374				37,667	39	200,000	0.57	RE			20,033	157,944	150,759			3,010,377	
Jul-00	27,500	1,800	30,000		163,374				37,667	39	100,000	0.57	RE			32,103	157,944	93,759			3,033,843	
Aug-00	10,500	1,800	30,000		163,374				37,667							20,033	157,944	36,759			3,005,238	
Sep-00	27,500	1,800	30,000		163,374				37,667							32,103	157,944	36,759			2,971,704	
FY00	228,000	21,600	366,000		1,960,488				452,000		2,200,000					504,816	1,899,589	1,258,110				
Oct-00	10,500	1,800	50,000		16,667				37,667	42	200,000	0.37	RE			20,033	69,367	81,500			3,025,970	Tank 42 Backlog from Tank 40
Nov-00	27,500	1,800	30,000		16,667				37,667	42	200,000	0.37	RE			32,103	55,167	81,500			3,081,107	
Dec-00	10,500	1,800	30,000		16,667				37,667	42	200,000	0.37	RE			20,033	55,167	81,500			3,141,173	
Jan-01	27,500	1,800	30,000		16,667				37,667	42	200,000	0.37	RE			32,103	55,167	81,500			3,196,309	
Feb-01	10,500	1,800	30,000		16,667				37,667	42	200,000	0.37	RE			20,033	55,167	81,500			3,256,376	
Mar-01	27,500	1,800	30,000		16,667				37,667							32,103	55,167	7,500			3,237,512	
Apr-01	10,500	1,800	30,000		16,667				37,667							20,033	55,167	7,500			3,223,578	
May-01	27,500	1,800	30,000		16,667				37,667							32,103	55,167	7,500			3,204,715	
Jun-01	10,500	1,800	30,000		16,667				37,667							20,033	55,167	7,500			3,190,781	
Jul-01	27,500	1,800	30,000		16,667				37,667							32,103	55,167	7,500			3,171,917	
Aug-01	10,500	1,800	30,000		16,667				37,667							20,033	55,167	7,500			3,157,984	
Sep-01	27,500	1,800	16,000		16,667				37,667							32,103	45,227	7,500			3,143,180	
FY01	228,000	21,600	366,000		200,000				452,000		1,000,000					312,816	666,260	460,000				

Appendix J.3 – Tank Farm Material Balance (Target Case)

End of	Influents (gal)									Backlog				Type I & III Tanks		Effluents (gal)					Usable	
	F Canyon		H Canyon		DWPF Recycle		ESP	Tank			Volume			Reused (kgal)							Space	
Mo/Yr	LHW	HHW	LHW	HHW	Sludge	Salt	WW	WW	Other	Tk	(gal)	SGF	Ev	Tk	Volume	2F Evap	2H Evap	RHLWE	Salt Proc.	Other	(gal)	Notes
Oct-01	10,500	1,800	50,000		8,333				37,667							20,033	65,617	3,750			3,124,280	
Nov-01	27,500	1,800	30,000		8,333				37,667							32,103	51,417	3,750			3,106,249	
Dec-01	10,500	1,800	30,000		8,333				37,667							20,033	51,417	3,750			3,093,149	
Jan-02	27,500	1,800	30,000		8,333				37,667							32,103	51,417	3,750			3,075,119	
Feb-02	10,500	1,800	30,000		8,333				37,667							20,033	51,417	3,750			3,062,018	
Mar-02	27,500	1,800	30,000		8,333				37,667							32,103	51,417	3,750			3,043,988	
Apr-02	10,500	1,800	30,000		8,333				37,667							20,033	51,417	3,750			3,030,888	
May-02	27,500	1,800	30,000		8,333				37,667							32,103	51,417	3,750			3,012,857	
Jun-02	10,500	1,800	30,000		8,333				37,667							20,033	51,417	3,750			2,999,757	
Jul-02	27,500	1,800	30,000		8,333				37,667							32,103	51,417	3,750			2,981,727	
Aug-02	10,500	1,800	30,000		8,333				37,667							20,033	51,417	3,750			2,968,626	
Sep-02	27,500	1,800	16,000		8,333				37,667							32,103	41,477	3,750			2,954,656	
FY02	228,000	21,600	366,000		100,000				452,000							312,816	621,260	45,000				
FY03	135,000	3,600	56,000		100,000				452,000							234,006	401,160	45,000			2,888,222	
FY04	120,000		56,000		100,000				452,000							220,800	401,160	45,000			2,827,182	
FY05	120,000		56,000		100,000				452,000							220,800	401,160	45,000			2,766,142	
FY06	120,000		56,000		100,000				452,000							220,800	401,160	45,000			2,705,102	
FY07	120,000		56,000		100,000				452,000							220,800	401,160	45,000			2,644,062	
FY08	120,000		56,000		100,000				297,000							174,300	292,660	45,000			2,583,022	
FY09	120,000		56,000		100,000		390,000		297,000							347,926	292,660	257,160		(1,098,000)	1,419,768	Tk 40 to ESP service
FY10	120,000		56,000		1,960,488	160,000	1,352,000	140,000	297,000							735,359	1,201,880	1,768,422	942,000		1,981,940	Start Salt Processing 4/10
FY11					1,960,488	320,000	280,000	380,000	297,000							322,127	1,234,120	1,392,193	2,399,000		4,091,891	
FY12					1,960,488	320,000	1,374,000	190,000	297,000							583,217	1,234,120	1,880,502	1,943,000		5,591,243	
FY13					1,960,488	320,000	774,000	140,000	297,000							380,230	1,234,120	1,525,990	2,089,000		7,329,094	
FY14					1,960,488	320,000	400,000		297,000							211,500	1,234,120	1,243,820	1,431,000		8,472,045	
FY15					1,960,488	320,000	2,076,000	190,000	297,000							798,029	1,234,120	2,262,390	590,000		8,513,096	
FY16					1,960,488	320,000	1,196,000	470,000	297,000							637,321	1,234,120	1,941,099	1,016,000		9,098,147	
FY17					1,960,488	320,000	430,000	380,000	297,000							368,027	1,234,120	1,473,793	1,799,000		10,585,599	
FY18					1,960,488	320,000	2,068,000	610,000	297,000							958,439	1,234,120	2,494,181	1,860,000		11,876,850	
FY19					1,960,488	320,000	944,000	560,000	297,000							595,107	1,234,120	1,854,613	2,103,000		Start Closing	
FY20					1,960,488	320,000	1,579,000	610,000	297,000							808,805	1,234,120	2,228,165	1,944,000		Type III Tanks	
FY21					1,960,488	320,000	2,051,000	140,000	297,000							770,992	1,234,120	2,220,678	2,177,000			
FY22					1,960,488	320,000		140,000	297,000							143,386	1,234,120	1,104,934	2,299,000			
FY23					1,960,488	320,000	400,000	280,000	297,000							320,071	1,234,120	1,401,248	1,150,000			
FY24					1,960,488	320,000	2,048,000	280,000	297,000							824,359	1,234,120	2,297,760	1,971,000			
FY25					1,960,488	320,000	1,872,000	140,000	297,000							716,218	1,234,120	2,123,302	1,921,000			
FY26					1,960,488	320,000	250,000	140,000	297,000							219,886	1,234,120	1,240,934	1,444,000			
FY27					1,960,488	320,000	1,450,000	700,000	297,000							804,229	1,234,120	2,208,591	272,000			
FY28					1,960,488	320,000	600,000	140,000	297,000							326,986	1,234,120	1,431,334	505,000			
FY29					1,960,488	320,000	210,000		297,000							153,360	1,234,120	1,140,460	201,000			
FY30					1,960,488	320,000	580,000		297,000							266,580	1,234,120	1,341,740	274,000			
FY31					1,960,488	320,000		560,000	297,000							306,243	1,234,120	1,341,077	233,000			2F shuts down end of FY31
FY32					1,960,488	320,000		560,000	297,000								1,234,120	1,647,320	223,000			2H shuts down end of FY32
FY33					326,748			420,000										693,073				RHLWE shuts down end of program

Appendix J.4 – Salt Processing (Target Case)

SALT SOLUTION PROCESSING FACILITY									SALTSTONE FACILITY				
Fiscal Year	FY Start Date	Source Tank	Waste Removed (Kgal)	Feed Type	Salt Feed to Salt Processing (Kgal)	NaTPB Req'd (Kgal)	10 wt% ppt Feed to DWPF (Kgal)	Ppt Cs Conc (Ci/gal)	Salt Processing Filtrate to Grout (Kgal)	ETF Feed to Grout (Kgal)	Grout Produced (Kgal)	Cum Vault Cells Filled	Active Grout Vault #'s
FY10	10/1/09	11	198	cs	198	98	161	43.3	4,058	90	7,342	9.71	4
		14	153	ds	413								
		30	230	cs	230								
		33	127	cs	127								
		38	100	cs	100								
		41	16	cs	16								
		41	269	ds	725								
		46	90	cs	90								
		47	110	cs	110								
				dw	703								
	Type III Tank space gain		942	total	2,712								
FY11	10/1/10	7	151	cs	151	198	326	41.9	7,528	180	13,643	17.23	4, 1 and 2
		18	313	cs	313								
		19	258	cs	258								
		29	217	cs	217								
		32	621	cs	621								
		33	222	ds	600								
		38	160	cs	160								
		41	148	ds	400								
		46	290	cs	290								
		47	741	ds	2,000								
				dw	276								
	Type III Tank space gain		2,399	total	5,286								
FY12	10/1/11	4	346	cs	346	198	325	55.0	6,877	180	12,491	24.11	2 and 3
		25	100	cs	100								
		29	74	ds	200								
		30	170	cs	170								
		34	500	cs	500								
		38	200	cs	200								
		41	789	ds	2,131								
		47	110	ds	297								
				dw	866								
	Type III Tank space gain		1,943	total	4,810								
FY13	10/1/12	13	60	cs	60	199	327	34.1	6,655	180	12,098	30.78	3 and 5
		25	63	cs	63								
		29	906	ds	2,446								
		30	140	cs	140								
		34	420	cs	420								
		38	160	cs	160								
		46	400	cs	400								
				dw	960								
	Type III Tank space gain		2,089	total	4,649								
FY14	10/1/13	13	358	cs	358	198	324	34.5	6,270	180	11,417	37.08	5 and 6
		25	1,086	ds	2,931								
		27	50	cs	50								
		34	208	ds	561								
		38	88	cs	88								
				dw	385								
	Type III Tank space gain		1,431	total	4,373								

Appendix J.4 – Salt Processing (Target Case)

SALT SOLUTION PROCESSING FACILITY									SALTSTONE FACILITY				
Fiscal Year	FY Start Date	Source Tank	Waste Removed (Kgal)	Feed Type	Salt Feed to Salt Processing (Kgal)	NaTPB Req'd (Kgal)	10 wt% ppt Feed to DWPF (Kgal)	Ppt Cs Conc (Ci/gal)	Salt Processing Filtrate to Grout (Kgal)	ETF Feed to Grout (Kgal)	Grout Produced (Kgal)	Cum Vault Cells Filled	Active Grout Vault #'s
FY15	10/1/14	2	525	ds	1,418	200	327	40.6	5,351	180	9,790	42.47	6 and 7
		10	209	ds	563								
		13	250	cs	250								
		26	150	cs	150								
		27	50	cs	50								
		30	90	cs	90								
		35	300	cs	300								
				dw	881								
		Type III Tank space gain	590	total	3,702								
FY16	10/1/15	1	19	cs	19	197	324	34.5	6,887	180	12,509	49.37	7 and 8
		1	470	ds	1,270								
		9	527	ds	1,423								
		26	366	cs	366								
		30	350	cs	350								
		46	300	cs	300								
				dw	1,092								
		Type III Tank space gain	1,016	total	4,820								
FY17	10/1/16	3	525	ds	1,418	197	324	49.9	7,278	180	13,201	56.65	8, 9 and 10
		30	120	cs	120								
		31	248	cs	248								
		35	600	cs	600								
		38	130	cs	130								
		38	445	ds	1,202								
		43	56	cs	56								
		46	200	cs	200								
				dw	1,129								
		Type III Tank space gain	1,799	total	5,103								
FY18	10/1/17	28	186	cs	186	197	325	33.2	6,361	180	11,578	63.03	10 and 11
		31	623	ds	1,683								
		35	333	cs	333								
		38	407	ds	1,100								
		44	200	cs	200								
		46	110	cs	110								
				dw	872								
		Type III Tank space gain	1,860	total	4,484								
FY19	10/1/18	28	1,011	ds	2,731	197	325	25.2	7,209	180	13,079	70.24	11 and 12
		30	200	cs	200								
		31	370	ds	1,000								
		42	200	cs	200								
		44	78	cs	78								
		45	137	cs	137								
		49	106	cs	106								
				dw	603								
		Type III Tank space gain	2,103	total	5,055								

Appendix J.4 – Salt Processing (Target Case)

SALT SOLUTION PROCESSING FACILITY									SALTSTONE FACILITY				
Fiscal Year	FY Start Date	Source Tank	Waste Removed (Kgal)	Feed Type	Salt Feed to Salt Processing (Kgal)	NaTPB Req'd (Kgal)	10 wt% ppt Feed to DWPF (Kgal)	Ppt Cs Conc (Ci/gal)	Salt Processing Filtrate to Grout (Kgal)	ETF Feed to Grout (Kgal)	Grout Produced (Kgal)	Cum Vault Cells Filled	Active Grout Vault #'s
FY20	10/1/19	27	80	cs	80	201	329	38.8	6,092	180	11,101	76.36	12 and 13
		29	270	cs	270								
		30	100	cs	100								
		36	155	cs	155								
		42	200	cs	200								
		44	969	ds	2,617								
		46	170	cs	170								
				dw	682								
	Type III Tank space gain		1,944	total	4,274								
FY21	10/1/20	25	200	cs	200	194	319	44.9	6,857	180	12,455	83.22	13 and 14
		29	120	cs	120								
		39	600	cs	600								
		43	150	cs	150								
		45	1,107	ds	2,990								
				dw	816								
	Type III Tank space gain		2,177	total	4,876								
FY22	10/1/21	27	100	cs	100	201	330	57.3	6,749	180	12,264	89.99	14 and 15
		29	400	cs	400								
		37	168	cs	168								
		36	1,072	ds	2,895								
		39	371	cs	371								
		43	188	cs	188								
				dw	889								
	Type III Tank space gain		2,299	total	5,011								
FY23	10/1/22	25	100	cs	100	195	320	44.9	6,389	180	11,627	96.40	15 and 16
		27	150	cs	150								
		30	326	cs	326								
		37	100	cs	100								
		37	954	ds	2,575								
		39	200	cs	200								
		41	200	cs	200								
		46	74	cs	74								
				dw	1,021								
	Type III Tank space gain		1,150	total	4,746								
FY24	10/1/23	27	258	cs	258	198	324	21.3	4,843	180	8,891	101.30	16 and 17
		29	600	cs	600								
		30	65	ds	175								
		41	520	cs	520								
		42	264	cs	400								
		46	264	ds	714								
				dw	953								
	Type III Tank space gain		1,971	total	3,620								
FY25	10/1/24	25	1,000	cs	1,000	203	330	33.3	4,235	180	7,815	105.60	17 and 18
		27	120	cs	120								
		41	500	cs	500								
		42	301	cs	301								
				dw	1,257								
	Type III Tank space gain		1,921	total	3,178								

Appendix J.4 – Salt Processing (Target Case)

SALT SOLUTION PROCESSING FACILITY									SALTSTONE FACILITY				
Fiscal Year	FY Start Date	Source Tank	Waste Removed (Kgal)	Feed Type	Salt Feed to Salt Processing (Kgal)	NaTPB Req'd (Kgal)	10 wt% ppt Feed to DWPF (Kgal)	Ppt Cs Conc (Ci/gal)	Salt Processing Filtrate to Grout (Kgal)	ETF Feed to Grout (Kgal)	Grout Produced (Kgal)	Cum Vault Cells Filled	Active Grout Vault #'s
FY26	10/1/25	25	150	cs	150	89	146	14.4	3,401	180	6,338	109.10	18
		27	454	ds	1,225								
		29	700	cs	700								
		41	140	cs	140								
				dw	304								
		Type III Tank space gain	1,444	total	2,519								
FY27	10/1/26	25	9	cs	9	16	26	14.2	466	180	1,143	109.73	18
		29	165	cs	165								
		41	98	cs	98								
				dw	75								
		Type III Tank space gain	272	total	347								
FY28	10/1/27	25	43	cs	43	40	65	16.0	919	180	1,945	110.80	18 and 19
		29	365	cs	365								
		41	97	cs	97								
				dw	183								
		Type III Tank space gain	505	total	688								
FY29	10/1/28	25	7	cs	7	12	19	11.9	342	180	924	111.31	19
		29	97	cs	97								
		41	97	cs	97								
				dw	53								
		Type III Tank space gain	201	total	254								
FY30	10/1/29	25	34	cs	34	18	30	13.5	576	180	1,338	112.05	19
		29	142	cs	142								
		41	98	cs	98								
				dw	83								
		Type III Tank space gain	274	total	357								
FY31	10/1/30	25	17	cs	17	14	23	12.1	475	180	1,159	112.69	19
		29	119	cs	119								
		41	97	cs	97								
				dw	66								
		Type III Tank space gain	233	total	299								
FY32	10/1/31	25	21	cs	21	13	21	11.1	439	180	1,096	113.29	19
		29	104	cs	104								
		41	98	cs	98								
				dw	55								
		Type III Tank space gain	223	total	278								

Notes:
* Space gain refers to Type III tanks only and is equal to cs + ds (prior to dissolution)
* cs = concentrated supernate
* ds = dissolved salt cake
* dw = dilution water to bring salt feed to 6.44 [Na+] for feed to Salt Processing, additional dilution to 4.7 [Na+] is performed at the Salt Processing Facility.
* NaTPB = sodium tetraphenylborate
* Precipitate Cesium Ci/gal has not been adjusted for decay
* With a permanent roof, each cell measures 98.5 x 98.5 x 25 feet = 242,500 cu ft, and holds 1,814 kgal grout, or 1,025 kgal feed.
* Existing Vault #1 has 6 cells, of which 3 are already filled. Vault #4 has 12 cells, of which 1 is already filled. All new vaults will have six cells each.
* Vault # fill sequence is assumed to be 4, 1, 2, 3, 5, 6, 7, ... etc.

Appendix J.5 – Sludge Processing (Target Case)

	Waste Removal		ESP Pretreatment									DWPF Vitrification						
A Sludge Batch	B Source Tanks	C Sludge Content (kg)	D Alum. Rem'd (wt %)*	E Alum. Dis. Start Date	F Wash Start Date	G Feed Prep Total Dur. (months)	H Total ESP Water Vol. (kgal)	I Na (wt% dry)*	J Hg (wt% dry)*	K Total Solids (wt%)*	L Pretreated Volume (kgal)*	M Feed Volume (kgal)	N Start Feed	O Canister Yield*	P Feed Duration (years)	Q Finish Feed	R Feed Tank	S Waste Loading (wt %)*
1A	51	na	na	na	na	na	na	8.80		16.4	491	491	3/1/96	492	2.75	8/30/98	51	25.0
												-140	(Tk 51 heel @ 40 ")					
												351						
1B	42	420,861	na	na	na	na	na	7.77		16.5	460	460	10/1/98	450	2.00	9/30/00	51	25.0
	total	420,861											(Tk 51 heel @ 40 ")					
													(Shutdown sludge processing End of FY00)					
													10/1/09	150	0.75	7/1/10	51	25.0
													(Restart sludge processing in FY10)					
2	8	182,500	na	na	7/31/09	12	2,080	6.90		16.9	582	582	7/1/10	575	2.88	5/16/13	40	25.0
	40	167,100										-140	(Tk 40 heel @ 40 ")					
	total	349,600										442						
3	7 (70%)	288,960			4/15/12	23	2,590	6.90		16.5	709	670	5/16/13	622	3.11	6/24/16	51	28.8
	11	124,400	75	7/16/11														
	18	20,740																
	19	2,794																
	total	436,894																
4	4	65,480			2/23/15	27	3,670	8.90		16.5	610	610	6/24/16	555	2.77	4/2/19	40	29.8
	7 (30%)	123,840																
	15	165,800	50	4/25/14														
	total	355,120																
5	5	57,630			3/3/18	24	3,080	6.90		16.5	685	685	4/2/19	523	2.62	11/12/21	51	30.8
	6	38,710																
	13 (30%)	125,280	50	5/2/17														
	12	189,700	50															
	21	6,393																
	22	13,260																
	total	430,973																
6	13 (70%)	292,320	35	5/14/19	3/13/20	31	4,090	7.02		16.5	881	881	11/12/21	779	3.89	10/4/25	40	27.8
	23	59,110																
	26	154,900																
	total	506,330																
7	47	137,800			2/3/24	31	4,320	6.93	3.00	16.5	606	606	10/4/25	498	2.49	3/30/28	51	31.3
	32	195,600	86	4/5/23														
	33	62,400																
	total	395,800																

Appendix J.5 – Sludge Processing (Target Case)

	Waste Removal		ESP Pretreatment										DWPF Vitrification						
A Sludge Batch	B Source Tanks	C Sludge Content (kg)	D Alum. Rem'd (wt %)*	E Alum. Dis. Start Date	F Wash Start Date	G Feed Prep Total Dur. (months)	H Total ESP Water Vol. (kgal)	I Na (wt% dry)*	J Hg (wt% dry)*	K Total Solids (wt%)*	L Pretreated Volume (kgal)*	M Feed Volume (kgal)	N Start Feed	O Canister Yield*	P Feed Duration (years)	Q Finish Feed	R Feed Tank	S Waste Loading (wt %)*
8	34	77,120			5/1/27	22	2,300	6.84	3.72	16.5	680	680	3/30/28	492	2.46	9/13/30	40	32.2
	35	139,000	61	6/30/26								140	(pump down Tk 40 heel to 0)					
	39	89,470	61									820						
	43	51,940																
	40 heel	72,000																
	total	429,530																
9	51 heel	72,562			1/13/30	19	790	6.95	1.52	16.5	442	442	9/13/30	438	2.19	11/21/32	51	30.3
	1-3,9-10,36,41	20,316																
	42 heel	31,042	48	3/15/29														
	Type III's	187,871	48															
	total	311,791																
Totals							22,920					5,967		5,573	28			

* General: As described in the text of the plan, several Source Tank changes have been made from Rev. 9 of the HLW System Plan due to the delay in Salt Processing. Insufficient time was available to run the CPES and PCCS models to fully assess the impact on the sludge batches from these Source Tank changes. It is expected that all changes can be accommodated with no significant impact on canister yields as shown above. Prior to the next revision of the HLW System Plan, all sludge batches will be run through the CPES and PCCS models for verification. For this revision of the plan, the numbers indicated with an * are the same as shown in Rev. 9 unless otherwise

A) Each Sludge Batch must be individually tested and confirmed to meet waste qualification spedicfications
B) Sludge in these tanks will comprise the batch.
C) Amount of sludge from each source tank in the batch obtained from WCS data base
D) Amount of aluminum removed from HM sludge (typically H-Area HHW sludge) per CPES model
E) Aluminum dissolution start date for H-Area sludge in batch. Note: H-Area sludge must be in ESP tank 1 mo. prior to this date to allow for settling and decant of transfer water.
F) Start date of water washing of combined H- & F-Area sludge to obtain proper alkali composition of the sludge slurry. Note: F-Area sludge must be in ESP tank 1 mo. prior to this date.
G) Total planned duration of aluminum dissolution, washing, sampling, test glass production, and associated decants
H) Total volume of sludge transfer water, aluminum dissolution and wash water decants
I) Amount of total Na in washed sludge (dry basis)
J) Amount of total Hg in washed sludge (dry basis)
K) Total solids (soluble and insoluble) in washed sludge, normally adjusted to 16.5 wt%
L) Volume of sludge at given wt% total solids before heel effects (Batch 1B is actual. Batch 2 and beyond are based on ratio of Rev. 9 numbers with sludge kg values for new batch makeups)
M) Volume of sludge available for feed after adding or subtracting pump heel
N) Start feed date based on depletion of previous batch down to pump heel
O) Estimated number of canisters produced given the pretreatment as shown. Numbers have been adjusted from Rev. 9 based on Batch 1A operating data and feed availabilty changes as described in the text of this plan.
P) Column O divided by the planned canister production during the period in which the batch is vitrified
Q) Column N plus column P. Finish Feed means when the last transfer of feed is sent from the Feed Tank. The last canister for the batch will be poured later. The DWPF has approximately 25 canisters of feed in process. Therefore 25 more canisters will be produced from the batch after the last feed is sent to DWPF.
R) Batch feed tank
S) Weight % of glass comprised of sludge oxides. Numbers have been adjusted from Rev. 9 for Batch 1B and 2 based on Batch 1A operating data.

Appendix J.6 – Canister Storage (Target Case)

End of Year	SRS Cans Produced Yearly	SRS Cans Produced Cum.	SRS Cans In GWSB #1 (2,159 max) Added	SRS Cans In GWSB #1 (2,159 max) Shipped	SRS Cans In GWSB #1 (2,159 max) Cum.	SRS Cans In GWSB #2 (1000 cap.) Added	SRS Cans In GWSB #2 (1000 cap.) Shipped	SRS Cans In GWSB #2 (1000 cap.) Cum.	SRS Cans Shipped to Repository Each Year	SRS Cans Shipped to Repository Cumulative	Net Cans Stored At SRS
1996	64	64	64		64						64
1997	169	233	169		233						233
1998	250	483	250		483						483
1999	250	733	250		733						733
2000	200	933	200		933						933
2001	0	933	0		933						933
2002	0	933	0		933						933
2003	0	933	0		933						933
2004	0	933	0		933						933
2005	0	933	0		933	0		0			933
2006	0	933	0		933	0		0			933
2007	0	933	0		933	0		0			933
2008	0	933	0		933	0		0			933
2009	0	933	0		933	0		0			933
2010	200	1,133	200		1,133	0		0			1,133
2011	200	1,333	200		1,333	0		0			1,333
2012	200	1,533	200		1,533	0		0			1,533
2013	200	1,733	200		1,733	0		0			1,733
2014	200	1,933	200		1,933	0		0			1,933
2015	200	2,133	0	(500)	1,433	200	0	200	500	500	1,633
2016	200	2,333		(500)	933	200	0	400	500	1,000	1,333
2017	200	2,533		(500)	433	200	0	600	500	1,500	1,033
2018	200	2,733	0	(400)	33	200	0	800	400	1,900	833
2019	200	2,933	200	0	233	0	(400)	400	400	2,300	633
2020	200	3,133	200	0	433	0	(400)	0	400	2,700	433
2021	200	3,333	200	0	633	0	0	0	0	2,700	633
2022	200	3,533		(400)	233	200		200	400	3,100	433
2023	200	3,733			233	200		400	0	3,100	633
2024	200	3,933	200		433	0	(400)	0	400	3,500	433
2025	200	4,133	200		633	0		0	0	3,500	633
2026	200	4,333		(400)	233	200		200	400	3,900	433
2027	200	4,533			233	200		400	0	3,900	633
2028	200	4,733	200		433	0	(400)	0	400	4,300	433
2029	200	4,933	200		633	0		0	0	4,300	633
2030	200	5,133		(400)	233	200		200	400	4,700	433
2031	200	5,333			233	200		400	0	4,700	633
2032	200	5,533	200		433	0	(400)	0	400	5,100	433
2033	41	5,574	41	(474)	0	0			474	5,574	0

Appendix J.6 – Canister Storage (Target Case)

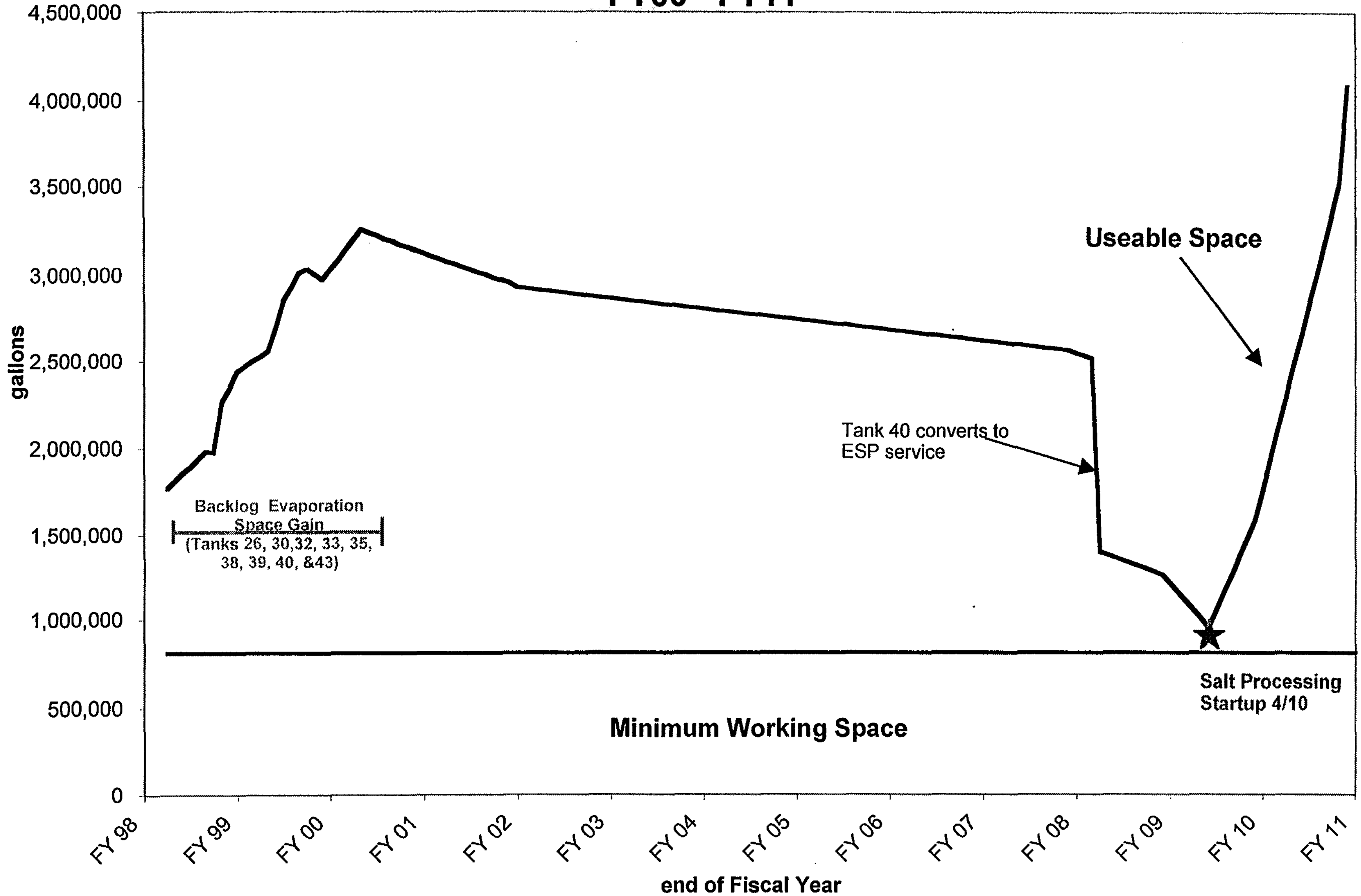
Notes:

1) GWSB #1 filling began in April 1996. It has 2,286 canister storage locations, less 122 locations for which the plugs cannot be repaired, less 5 positions being used for storage of non-radioactive test canisters = 2,159 usable storage locations. However, of the 2,159 usable positions, 450 locations are currently abandoned in place and will need repair/replacement plugs before they will be available for use.
2) GWSB#1 is expected to reach maximum capacity in FY07. Therefore, GWSB#2 must be ready to start operations in FY07.
3) GWSB#2 is sized to provide storage if the Canister shipment date is delayed by up to 2 years.
4) This System Plan assumes that canisters can be transported to the Federal Repository at a rate of 500 per year, starting in 2015.
5) A canister load-out facility will be required to move the canisters from the GWSB's to a truck or railcar. Assume one year for design (FY12) and two years for construction (FY13-14).
6) GWSB#1 will be emptied and available for D&D in FY24.
7) GWSB#2 will be emptied and available for D&D in FY26.
8) This System Plan does not include possible can-in-can disposition of excess plutonium.
9) This System Plan does not include possible storage of ~300 West Valley canisters at SRS.

Appendix J.7 – Near Term Saltstone Operations (Target Case)

FY	FY Start Date	Previous Year Tk 50 Inven. (Kgal)	ETF Conc (Kgal)	Material Fed to Saltstone (Kgal)	TK 50 Inventory (Kgal)	Grout Produced (Kgal)	Cum Vault Cells Filled	Active Vault #	Notes:
FY99	10/1/98	206 (as of 1/22/99)	120	0	326	0	3.50	---	3.2 cells already filled at the start of FY99. (3.0 cells in Vault 1 and 0.5 cells in Vault 4) Saltstone Facility in partial lay-up (not operating).
FY00	10/1/99	326	180	0	506	0	3.50	---	Saltstone Facility in partial lay-up (not operating).
FY01	10/1/00	506	180	0	686	0	3.50	---	Saltstone Facility in partial lay-up (not operating).
FY02	10/1/01	686	180	0	866	0	3.50	---	Saltstone Facility in partial lay-up (not operating).
FY03	10/1/02	866	180	0	1,046	0	3.50	---	Saltstone Facility in partial lay-up (not operating).
FY04	10/1/03	1,046	180	(1,226)	0	2,170	4.70	4	Saltstone Facility operates to de-inventory Tank 50.
FY05	10/1/04	0	180	(180)	0	319	4.87	4	Saltstone Facility operates as required to support ETF. Tank 50 mods required for return to waste storage by FY06
FY06	10/1/05	0	180	(180)	0	319	5.05	4	Saltstone Facility operates as required to support ETF.
FY07	10/1/06	0	180	(180)	0	319	5.22	4	Saltstone Facility operates as required to support ETF.
FY08	10/1/07	0	180	(180)	0	319	5.40	4	Saltstone Facility operates as required to support ETF.
FY09	10/1/08	0	180	(180)	0	319	5.57	4	Saltstone Facility operates as required to support ETF.
FY10	10/1/09	0	90	(90)	0	159	5.66	4	Saltstone Facility operates as required to support ETF.

Appendix J.8 - Useable Tank Space (Target Case) FY00 - FY11



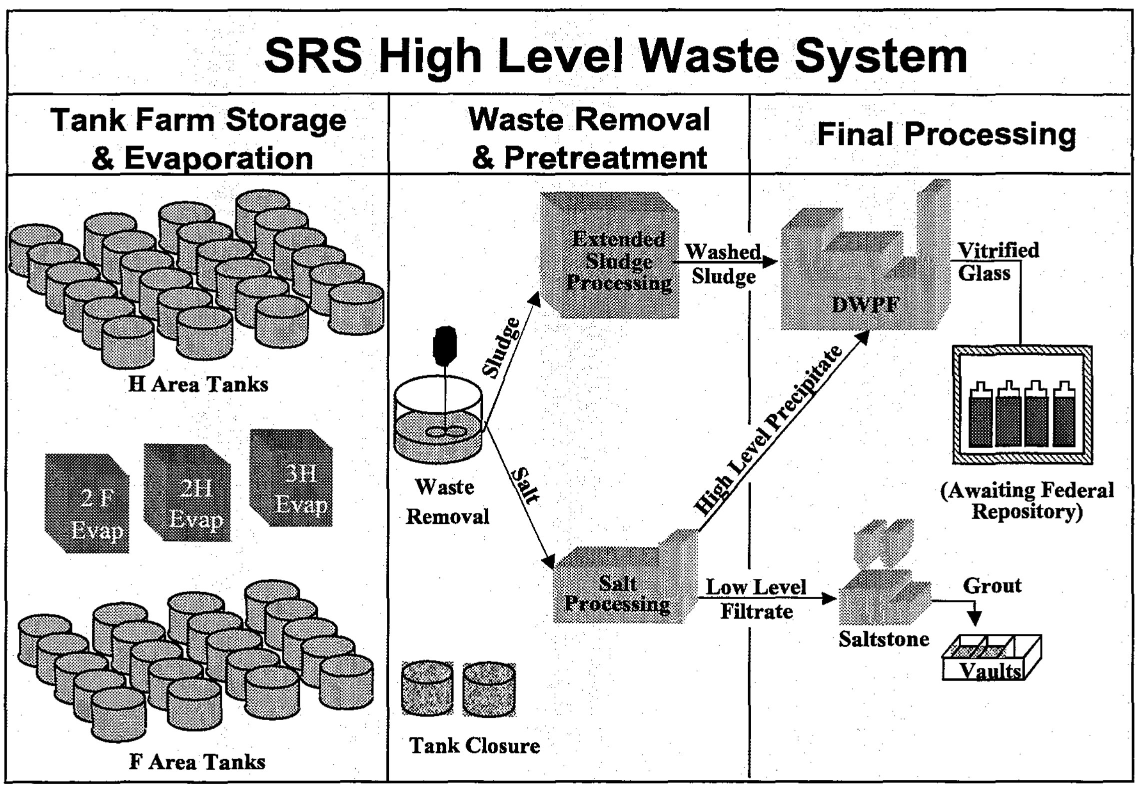
Appendix K

High Level Waste System Description

Background

The Savannah River Site (SRS) in South Carolina is a 300-square-mile Department of Energy (DOE) complex that has produced nuclear materials for national defense, research and medical programs since it became operational in 1951. As a waste by-product of this production, there are approximately 34 million gallons of liquid, high-level radioactive waste currently stored on an interim basis in 49 underground waste storage tanks. Continued, long-term storage of these liquid, high-level wastes in underground tanks poses an environmental risk (nine of the SRS tanks have a waste leakage history). Therefore, the High Level Waste Division at SRS has, since FY96, been removing waste from tanks; pre-treating it; vitrifying it; and pouring the vitrified waste into canisters for long-term disposal. By the end of FY99, over 700 canisters of waste will have been vitrified. The canisters vitrified to date have all been sludge waste. Salt waste processing was suspended in FY98 for technical reasons. The Record of Decision for selecting an alternative salt processing technology is scheduled for spring 2000, with construction of a salt processing facility scheduled to be completed by FY08 or FY10, depending on available funding. With adequate funding, the waste removal program at SRS can process approximately 200 canisters each year and be completed by FY24.

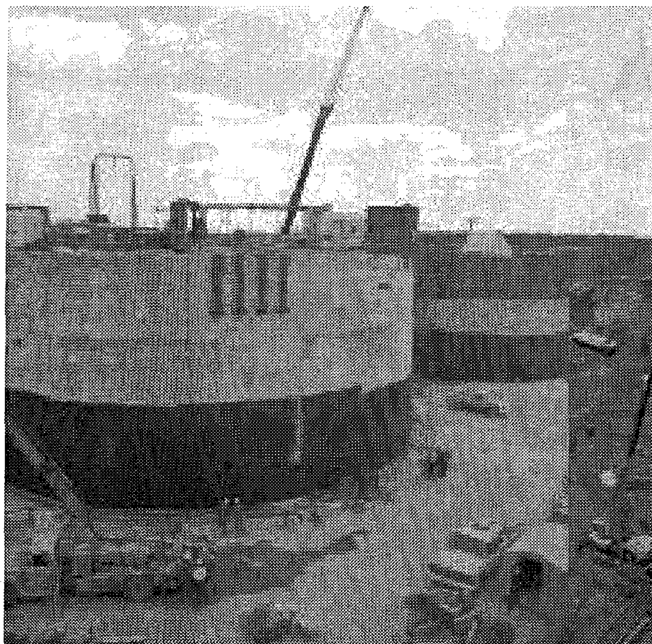
The High Level Waste System is the integrated series of facilities at SRS that convert HLW waste into glass. This system includes facilities for storage, evaporation, waste removal, pre-treatment, processing, and disposal. These facilities are shown in the sketch below and are briefly described in the text that follows.



Tank Storage

The 34 million gallons of liquid, high-level radioactive waste at SRS are stored in 49 underground waste storage and processing tanks at SRS. In addition, there are two waste storage tanks that have been emptied and closed, making a total of 51 original tanks. The waste storage tanks are located in two separate "tank farms," one in H-Area and the other in F-Area. Seven of the tanks are associated with the Waste Pre-Treatment Facility (WPT). The stored waste contains 420 million curies of radioactivity.

There are four types of underground waste storage tanks at SRS. The newest tank type, Type III, meets all regulatory requirements and accounts for 27 of the 51 total tanks. The remaining 24 tanks are either Type I, II, or IV tanks and are described as "high risk" tanks because they do not meet current secondary containment and leak detection requirements in the Federal Facility Agreement (FFA). Type IV tanks have no secondary containment. These "high risk" tanks, which were placed in service between 1954 and 1965 and sit near or at the water table, currently contain 8.5 million

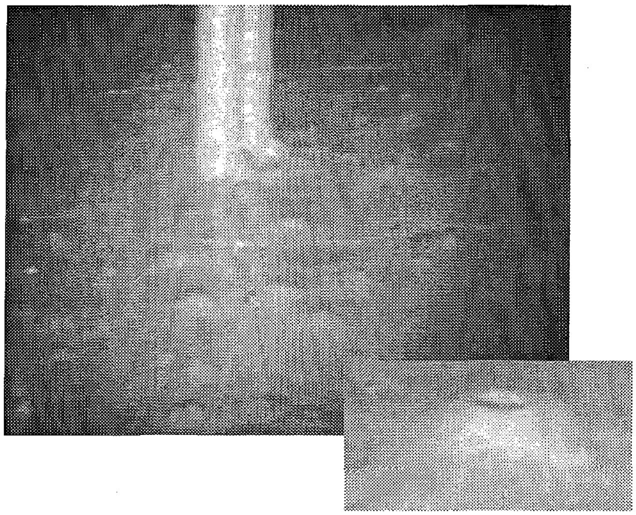


Tanks under construction. Note tank size relative to construction workers. Later, dirt is backfilled around the tanks to provide shielding.

Overhead View of H Tank Farm showing the tops of three tanks. Each tank is approximately 90' across and can contain over one million gallons of waste.

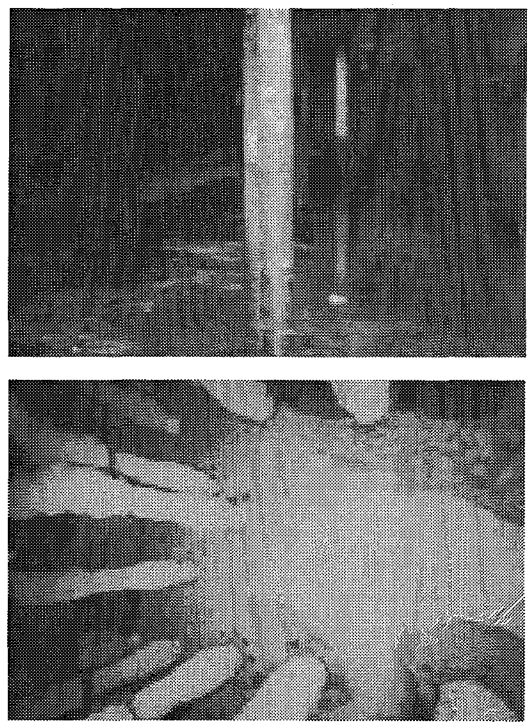
gallons of waste and 161 million curies of radioactivity. Under the FFA Waste Removal Plan and Schedule, SRS is committed to removing waste from and closing the Type I, II and IV tanks by FY22. Of these 24 "high risk" tanks, two have already been closed. Nine of the remaining 22 "high risk" tanks have a leakage history, one of which in 1959 leaked waste into its secondary pan and from there into the environment. Recently, a new kind of leak site, a horizontal crack approximately 18 inches in length, was found on one Type II tank, Tank 15. This leak site was discovered by SRS's extensive tank-integrity monitoring program. SRS has as yet not determined the cause of this crack, although it may indicate that a new mechanism is affecting tank wall integrity. In addition, increased corrosion is being seen in several tank secondary containment pans. These findings underscore the urgency to remove waste from these tanks as soon as possible.

The waste stored in SRS tanks is broadly characterized as either "sludge waste" or "salt waste". Sludge waste is insoluble and settles to the bottom of a waste tank, beneath a layer of liquid supernate. Sludge generally contains the radioactive elements Strontium, Plutonium, and Uranium in the form of metal hydroxides. Sludge is only 9% of the SRS waste volume (3 million gallons) but is 67% of the waste radioactivity (320 million curies).



Recently slurried sludge waste in a tank. Sludge consists of insoluble solids that settle to the bottom of a tank. Note the offgas bubbles, including hydrogen, generated from radiolysis.

Salt waste is soluble and is dissolved in the liquid. Salt generally contains the radioactive element Cesium and trace amounts of other soluble radioactive elements in the form of dissolved salts. Salt waste is 91% of the SRS waste volume (31 million gallons) and 33% of waste radioactivity (160 million curies). Salt waste can be further described as being "supernate" (in normal solution), "concentrated supernate" (after evaporation has removed some of the liquid) or "saltcake" (previously dissolved salts that have now crystallized out of solution). A single waste tank can contain sludge, supernate, and salt cake, although an effort is made to segregate the sludge and salt by tank.



Salt waste is dissolved in the liquid portion of the waste. It can be in normal solution as Supernate (top picture) or, after evaporation, as concentrated supernate or salt cake (bottom picture). The pipes in all the pictures are cooling coils

Volume Reduction — Evaporation

To better utilize available tank storage capacity, incoming liquid waste into the tank farms is evaporated to reduce its volume. This is critical because most of the SRS Type III waste storage tanks are already at or near full capacity. Since 1951 the tank farms have received approximately 100 million gallons of high-level liquid waste (consistency of "dirty water"), of which 66 million gallons have been evaporated, leaving the 34 million gallons being stored in the 49 storage tanks. The System Plan carefully tracks the projected available tank space to ensure that the tank farms do not become "water logged," a term meaning that all of usable tank space has been filled. A portion of tank space must be reserved for emergency transfers and for working space within the tanks. Waste receipts and transfers are normal tank farm activities as the tank farms receive new waste from the Canyons' stabilization and de-inventory programs, recycle water from DWPF processing and wash water from Waste Pre-treatment. The tank farms also make routine transfers to and from tanks and evaporators. Currently, there is a backlog of approximately 5.5 million gallons of waste that has not been evaporated. Once this backlogged waste has been evaporated, the working capacity of the tank farms will be steadily reduced each year until salt processing becomes operational.

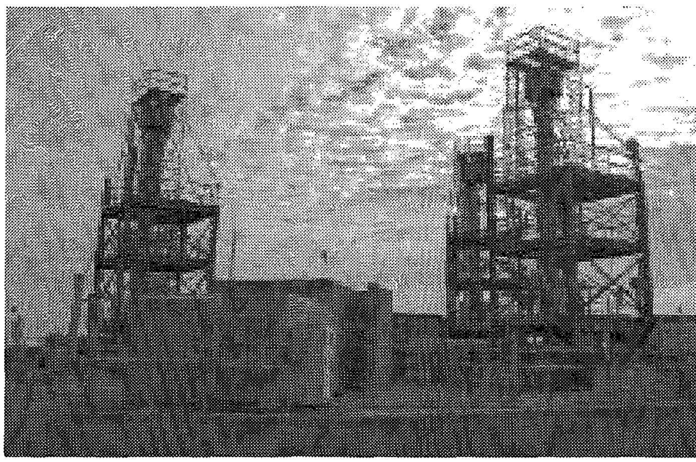
The two evaporator systems currently operating at SRS are the 2-H and 2-F systems. A third system, the Replacement HLW Evaporator (RHLWE), is scheduled for startup in late 1999. These evaporators will all be required to support the HLW program when DWPF and sludge and salt processing are fully operating.

Waste Removal & Tank Closure

Waste Removal from Tanks

During waste removal, water is added to waste tanks and agitated by slurry pumps. If the tank contains salt, this agitation dilutes the concentrated salt or re-dissolves the salt cake. It the tank contains sludge, this agitation suspends the insoluble sludge particles. In either case, the resulting liquid slurry is then pumped out of the tanks and transferred to pre-treatment.

Waste removal is a two-step process: a line item project to retrofit each waste tank with the requisite pumps and infrastructure and an operating project to operate the pumps and remove the waste. The line item project retrofits each tank with 45-foot long slurry pumps and transfer pumps, the steel infrastructure to support them, and various service

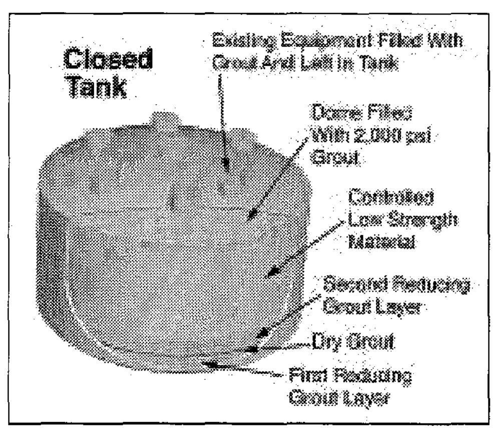


Typical Waste Removal equipment includes 3 to 4 45-foot long slurry pumps and one transfer pump. Note the substantial structural steel required to support the loads in the picture above. At right is the typical installation of a transfer pump, requiring difficult, high-risk entries into High Level Waste Tanks.

upgrades as needed (power, water, air and steam). Once the line item project is completed for a tank, waste removal operations operate the pumps, raising and lowering them to the proper depths as waste is slurried and transferred out of the tanks. Given the intense radiation fields of this highly toxic waste, all pump operation, tank maintenance and waste removal is done under radiological conditions, including adequate shielding or remote handling as necessary. The pump shafts are 45 feet long because they must reach to the bottom of the waste tanks.

Tank Closure

Once bulk waste has been removed from a tank, the tank is ready for closure. Tank closure involves heel removal and water washing, isolation and filling with grout. Heel removal and water washing are used to remove the residual waste "heel" in the tank (the last several inches at the bottom). Spray nozzles wash down the tank sides and bottom, and specialized equipment removes this last waste. The tank is then isolated by cutting and capping all service lines (power, steam, water and air) and sealing all tank risers and openings. Finally, the tank is filled with layers of grout, which bind up any residual waste, leaving the tank safe for long-term surveillance and maintenance. The schedule for waste removal and tank closure is part of the Federal Facility Agreement (FFA) between DOE, the Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC).



Pre-Treatment

Salt Processing: To separate Salt Waste into its High-level and Low-level Components

During salt processing, radioactive Cesium and trace amounts of Strontium and Plutonium are separated out from the salt supernate and dissolved salt cake that has been removed from waste storage tanks. This separated-out waste is highly radioactive because it contains almost all of the radioactivity of the original salt waste but only a small fraction of the original volume. It is high-level waste that must be vitrified at DWPF. The remaining waste, now without its highly radioactive components, contains only a small fraction of the original radioactivity but the bulk of the volume. It is low-level waste called "salt solution" that can be safely disposed, on site, at the Saltstone Facility. Separating salt waste into its high-level and low-level components greatly reduces the amount of waste that must be vitrified into glass canisters, in turn greatly reducing the capacity and costs of the Federal Repository being built to dispose of the HLW glass canisters.

Salt processing at SRS has been suspended pending the resolution of technical issues with the original ITP salt processing facility. The Record of Decision for selecting an alternative salt processing technology is scheduled for spring 2000, with construction of a salt processing facility scheduled to be completed by FY08 or FY10, depending on available funding.

Sludge Processing: To Produce "Washed Sludge"

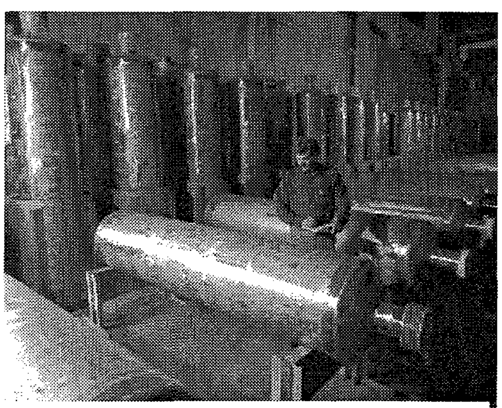
Sludge is "washed" to reduce the amount of non-radioactive aluminum and soluble salts remaining in the sludge. This ensures that the waste meets DWPF Waste Acceptance Criteria and Federal Repository requirements as well as reducing the overall volume of high-level waste to be vitrified. The processed sludge is called "washed sludge" and is sent to DWPF. During sludge processing, large volumes of wash water are generated and must be returned to the tank farms where it is volume-reduced by evaporation. Over the life of the waste removal program, the sludge currently stored in a number of tanks at SRS will be blended into a total of ten separate sludge "batches" to be processed and fed to DWPF for vitrification.

Final Processing

DWPF Vitrification

Sample of Vitrified Radioactive Glass

Final processing for the highly radioactive washed sludge and salt waste occurs at the DWPF facility. In a complex sequence of carefully controlled chemical reactions, this waste is blended with glass frit and melted at 2100 degrees Fahrenheit to vitrify it into a borosilicate glass form. The resulting molten glass is poured into 10-foot-tall, 2-foot-diameter, stainless steel canisters. As the filled canisters cool, the molten glass solidifies, immobilizing the radioactive waste within the glass structure. The vitrified waste cannot dissolve out of the glass and migrate into the environment even though the glass itself will remain radioactive for thousands of years. After the canisters have cooled, they are permanently sealed, and the external surfaces are decontaminated to meet US Department of Transportation requirements. The canisters are then ready to be stored on an interim basis on-site in the Glass Waste Storage Building, pending shipment to a Federal Repository for permanent disposal.



DWPF Canisters being received prior to being filled with Radioactive Glass)

DWPF has been fully operational since FY96. By the end of FY99 it will have filled over 700 canisters. The 34 million gallons of liquid waste in the SRS tank farms are projected to produce a total of approximately 5,700-6,000 canisters of vitrified glass. The duration of the SRS HLW program can be roughly estimated by dividing 5,000-5,300 to-go canisters by the projected out-year annual canister fill rate. Currently the projected annual fill rate averages 200 canisters per year into FY24, and then drops to 60 canisters per year for two years when sludge feed runs out and salt-

View through protective shielding of DWPF Melter Cell showing a canister being filled.

only canisters are projected. The number of canisters filled per year is largely dependent on funding availability. The most cost effective program for waste removal at SRS is to fund an increased annual canister fill rate in order to complete waste removal sooner and close the tank farms and waste processing facilities that much earlier.

Glass Waste Storage Building (GWSB)

Once the DWPF vitrification facility has filled, sealed and decontaminated the canisters, a Shielded Canister Transporter (SCT) moves the highly radioactive canisters from DWPF to GWSB #1 for interim storage. GWSB #1 is a standard, steel-frame building with a below-ground seismically-qualified concrete vault with vertical storage positions for 2,159 canisters. A five-foot thick concrete floor separates the storage vault from the operating area above ground. A second storage building, GWSB #2, will be constructed when GWSB #1 is filled to capacity. When the Federal Repository is opened (currently scheduled for FY15), all canisters will be shipped there at the rate of 500 canisters per year, with the last shipment scheduled for FY26.

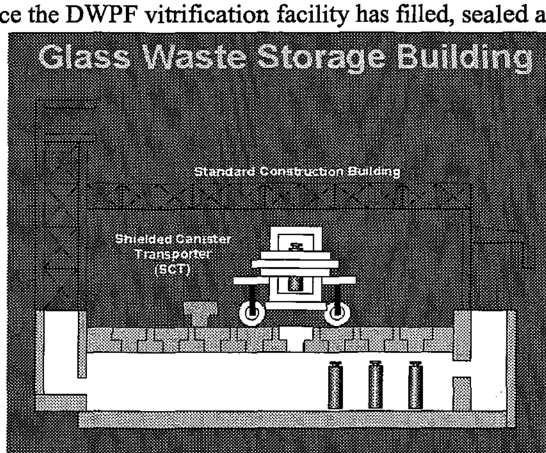
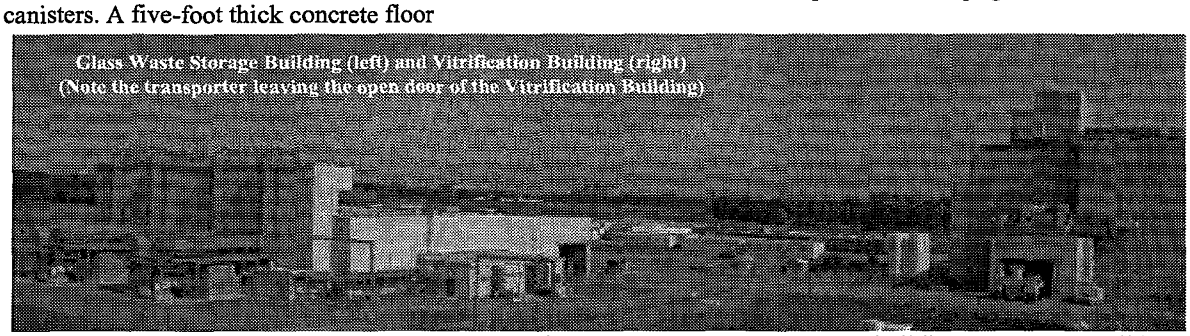


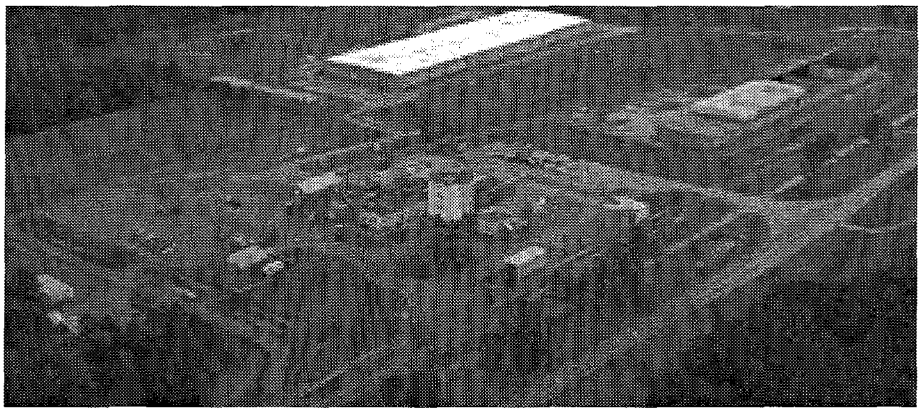
Diagram of Glass Waste Storage Building

The Shielded Canister Transporter (SCT) moves highly radioactive canisters from DWPF to the GWSB. The SCT removes a round shield plug from the floor, lowers the canister into a vertical storage position, and replaces the shield plug.



Saltstone: On-site Disposal of Low-Level Waste

Final processing for the low-level "salt solution" that results from salt processing occurs at the Saltstone Facility. In the Saltstone process this low-level solution waste is mixed with cement, flyash and slag to form a grout that can be safely and permanently disposed in on-site vaults. The grout mixture is transferred to disposal vaults where it hardens into "saltstone," a non-hazardous solid. The vaults are constructed on a "just-in-time" basis, in coordination with salt processing production rates.



View of Saltstone Facility: Processing Facility in foreground, 2 Vaults in rear.

HLW-99-0071

High Level Waste Division

High Level Waste System Plan Revision 10 Update (U)

September 29, 1999

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High Level Waste System Plan, Revision 10 Update

This update to the High Level Waste System Plan, Revision 10 (HLWSP, Rev. 10), discusses the recommendations of the HLW Tank Space Management Team (WSRC-RP-99-00005, August, 1999). These recommendations will be incorporated into the next revision of the System Plan to be issued in FY00.

SUMMARY

The HLW System Plan, Rev. 10, was issued in July 1999. One of its key issues dealt with the availability of adequate waste storage space in the Tank Farms. To fully support the HLW Program, the HLWSP, Rev. 10 assumed that three (3) old-style, high-risk tanks would be re-used to store waste.

The HLWSP, Rev. 10 stated that a HLW Space Management (SM) Team had been formed to study the available tank space issue in depth. The team was chartered to complete a detailed systems engineering analysis and recommend the best management practices for safe stewardship of high level waste while maximizing available tank space. The Team's report, issued in August 1999, outlined the recommended strategy for managing Tank Farm space until the planned startup of Salt Processing in FY10.

In short, the Space Management Team recommended the following actions to manage tank space:

Actions consistent with the HLWSP, Rev. 10 strategy:

- Continue to evaporate liquid waste, including the backlog of liquid waste that is waiting to be fully concentrated;
- Do not assign Tank 49 to Salt Processing, but use it instead for general HLW storage;
- Install a staging tank for ETF bottoms and operate Saltstone intermittently to remove and process these staged ETF bottoms so that Tank 50 can be freed up to return to general HLW storage.

Actions that complement the HLWSP, Rev. 10 strategy:

- Avoid returning the DWPF aqueous byproduct (i.e., DWPF "recycle") to the Tank Farms;
- If necessary, near the end of the period incrementally reduce the minimum emergency space (presently set at 2,600 kgal for the F and H Tank Farms) to the AB minimum requirement of 1,300 kgal;
- Where appropriate, implement the ideas that the Team identified to achieve small incremental storage volumes.

These combined actions will adequately manage tank space and avoid the necessity of reusing old style tanks for storage capacity. The substitution of the above space management strategies for those contained in HLWSP, Rev. 10 does not significantly affect the HLW System production rates or cost profiles.

The Tank Space Team's recommended strategy will be updated and discussed in detail in future revisions of the HLW System Plan as assumptions are validated or revised and as new process information becomes available. Tank space management techniques will continue to be highlighted and refined with all future revisions of the HLWSP.

DISCUSSION

Tank Farm Waste Storage Space

The amount of useable waste storage space in the Tank Farms is steadily being consumed by continued waste receipts, as is indicated by the following estimated new receipts for FY00:

- DWPF Recycle water 2,236,000 gallons in 280 receipts;
- Sludge Wash Water 728,000 gallons
- Canyon Wastes 615,000 gallons in 460 receipts;
- RBOF 150,000 gallons in 25 receipts.

These receipts are reduced by evaporation (the Tank Farm evaporation systems evaporate approximately 70 - 90% of these receipts depending on the influent source), but the negative impact on available tank storage space is significant. Furthermore, since early sludge removal is conducted from old style tanks, it does not result in an overall net gain in available space in the Type III tanks. In fact, due to the large amounts of sludge processing wash water returned to the Type III tanks, there is an actual overall net space loss in Type III tanks. This is especially true through FY10 when sludge is only being removed from high risk, old-style tanks. The overall net waste inventory being stored will begin to be reduced only when salt processing is operational and the salt waste is removed from the tanks.

Based on the assumptions in HLWSP, Rev. 10 for the waste generating facilities projected operating schedules, the Tank Farms will run out of available storage capacity in Type III tanks by FY03 unless alternative storage options are implemented.

The projected startup of Salt Processing in HLWSP, Rev. 10 was delayed from FY02 to FY10, further aggravating the waste storage problem. To study available waste storage space in depth, a HLW Space Management Team was chartered to recommend the best management practices for safe stewardship of high level waste while maximizing available tank space. The Team issued a final report (WSRC-RP-99-00005) in August 1999. The results of this report will be incorporated into the next revision of the Plan. Each of the six recommended space gain ideas is discussed in more detail below.

1. Evaporate Backlog Waste

For the past several years, approximately 3.5 million gallons of waste has been stored in Tanks 30, 35, 39 and 40 in anticipation of providing feed to the Salt Processing Facility. Now that salt processing has been delayed, this stored waste (or "backlog waste") should be further evaporated to reduce its volume and thereby recover space in the Tank Farm. The Tank Farms are evaporating this backlog waste as part of their normal evaporator operations. Current plans are to evaporate all the currently stored backlog waste over the next 2-3 years.

The logistics of making the waste transfers required to support both evaporation of backlog waste and DWPF processing will be a major challenge for HLW. The number of annual Tank Farm transfers must increase significantly. For example, the planned FY2000 tank-to-tank transfers to evaporate backlog waste and to prepare Sludge Batch 2 for processing are almost triple the number of transfers made over the last three years combined.

The principal risks for this idea relate to the ability of the evaporators and infrastructure to operate on such a demanding schedule

2. Recover Tank 49 for High Level Waste Storage

This idea requires Tank 49, which had previously been allocated as a salt processing tank, to be returned to the Tank Farms for HLW storage. However, Tank 49 currently stores approximately 85 kgal of waste solution, which contains benzene producing material, from ITP demonstration runs. DNFSB 96-1 issues regarding this solution must be resolved before the tank can be used for waste storage. In addition, physical modifications to transfer lines must also be made to tie Tank 49 back into transfer lines to HDB-7 and to disconnect Tank 49 from its ties to the Late Wash Facility.

The principal risk associated with return of Tank 49 is that the forecasted Tetraphenylborate intermediates depletion rate and subsequent benzene generation rate do not match the actual sample profiles. This could delay the currently forecasted date for the return of Tank 49 to HLW service by FY01.

3. Recover Tank 50 for High Level Waste Storage

Tank 50 is presently used as a receipt tank for Effluent Treatment Facility (ETF) bottoms, an aqueous waste that is ready for final treatment and disposal as Saltstone. Based on current forecasts, Tank 50 will be filled in FY2004. The Saltstone Facility must restart in FY2004 to process the waste stored in Tank 50 to prevent shutdown of ETF and to recover Tank 50 for HLW storage.

To reclaim Tank 50 for HLW storage, either continuous operation of Z-Area is required or alternate storage and treatment is needed to eliminate transfer of ETF bottoms to Tank 50. The SM Team recommends that a new storage tank for ETF bottoms be constructed. The size of the tank should be optimized to facilitate periodic transfers to the Saltstone Facility and proper utilization of operating personnel. In addition to the new tank, some transfer line modifications and Tank 50 shielding modifications must be completed.

The principal risk associated with the Recovery of Tank 50 for HLW storage is that the new tank for ETF bottoms and other required modifications will not be completed by FY2004. This would require continuing (intermittent) operation of Z-Area until the changes were complete.

4. Elimination of DWPF Recycle from the Tank Farm System

DWPF generates approximately 2 million gallons of waste a year that is recycled back to the Tank Farm. Much of this waste is water that can be removed from the Tank Farm through evaporation. However, even after evaporation, the 2 millions gallons received results in approximately 200,000 gallons of concentrated supernate that takes up tank space. By diverting the DWPF recycle stream from the Tank Farm, space gain and processing flexibility can both be realized. Elimination of the recycle stream from the Tank Farm is required by FY04 to meet the SM Team recommended space management strategy.

The SM Team selected acid evaporation at DWPF as the preferred process technology for eliminating the transfer of recycle to the Tank Farm. Though the SM Team report lists the DWPF Salt Cell as the preferred location of the new evaporator, it is recommended that a study be completed to optimize the final location.

The principal uncertainty associated with this evaporator is how to handle the evaporator bottoms. A preliminary review revealed several technical issues that could impact Melter operation, but the SM Team judged all of these issues could be resolved as part of the process development.

5. Reduce Emergency Space to 1300 kgal

The SM Team analyzed the long-standing practice of maintaining 1.3 million gallons of emergency space in the H-Area Tank Farm and the F-Area Tank Farm (2.6 million gallons total). The Liquid Radioactive Waste Handling Facilities Safety Analysis Report (LRWHF SAR), WSRC-SA-33, specifies a "defense-in-depth" emergency space value for the Tank Farm equal to the largest tank inventory (1.3 million gallons). The use of the Inter-Area Line (IAL) would be required to reduce the Emergency Space to the minimum value of 1.3 million gallons. The IAL is an underground transfer line between F- and H-Tank Farms of approximately 2.2 miles in length.

This idea states that the minimum emergency space would be reduced incrementally from its current value of 2.6 million gallons, as required, to a level that could eventually drop to the Authorization Basis (AB) "defense-in-depth" value of 1.3 million gallons.

Though a viable idea, the SM Team recommended that this idea should only be implemented, if required, near the end of the period before the start of Salt Processing. This is due to the challenges it presents to the operation of the Tank Farm. The SM Team identified several conditions that must be assessed before this idea is implemented. A prerequisite for reducing the Emergency Space would be to qualify the IAL for emergency transfer readiness. Procedures must be written and some upgrades made to the IAL to assure it is always available. The frequency of use of the IAL will increase significantly over the next few years as sludge slurry is sent to the Extended Sludge Processing (ESP) Facility and as backlog waste and wash water are sent to the 2F evaporator. Experience gained from these transfers will provide a higher confidence in HLW's ability to use the IAL for emergency transfers.

6. Small Volume Gain Ideas

In addition to the major space gain ideas described above, the SM Team identified a list of ideas that have the potential to yield smaller increases in available space. The group of ideas can be broken down into two main categories. Some provide small volume gains ranging up to about 600 kgal. Others suggest better mechanisms (e.g. changing operating practices or developing better tracking indicators) that should be evaluated further. Even if the space gains from these ideas are small, they could result in better space forecasting to better manage the available space. If successfully implemented, the small volume gain ideas could also result in overall cost savings if they eliminate the need for other more costly space gain ideas. The small volume ideas will be evaluated and implemented over the next several years to maximize available tank space.

Some of the main small volume gain ideas include:

- *Perform Aluminum Dissolution with High Hydroxide Waste*

  This idea proposes to use existing concentrated supernate that is high in hydroxide for aluminum dissolution rather than adding fresh sodium hydroxide. If successfully implemented, the loss of up to 600 kgal of available space is avoided by eliminating the addition of new salt and sodium hydroxide during the aluminum dissolution process.

- *Install Telescoping Transfer Jets (TTJ) in Selected Tanks*

  Transfer jets are used to move waste from tank to tank to support processing activities. Some of the fixed height transfer jets are set too high and will not allow complete removal of supernate to enable full evaporation of existing waste. Because of this condition, several tanks contain supernate that has not been fully concentrated. For example, the existing transfer jet in Tank 35 is at a level of 150 inches from the tank bottom. If a new TTJ were installed in Tank 35, up to an additional 300 kgal of space could be gained by evaporation of the additional supernate that could be removed from the tank.

  The principal risk associated with this idea is difficulty (cost, Radcon concerns, etc.) in the removal and disposal of an existing jet and in the subsequent installation of a new TTJ in the required riser.

- *Revise Tank Farm Waste Acceptance Criteria (WAC)*

  This idea proposes to revise the Tank Farm WAC to eliminate or modify practices that can affect space negatively, especially excess caustic additions and dilutions imposed on receipts from the Canyons and recycle from DWPF. The Tank Farm WAC requires sufficient caustic to be added to waste before it is transferred to assure the tank chemistry is not altered when the waste is added to the tank. Uncertainty related to splashing of waste on walls above the liquid level and the inability to determine how well the new waste mixes with existing waste in the tank has led to these stringent specifications. Improved monitoring of tank chemistry may allow the concentration of inhibitors to be reduced in waste sent to the Tank Farm.

- *Implement Ideas to Reduce the Volume of DWPF Recycle*

  Several ideas have been identified that would reduce the volume of DWPF recycle waste sent to the Tank Farm. The DWPF recycle stream has low salt concentration and can be easily evaporated. However, the inhibitors that must be added to this high volume stream to meet the Tank Farm WAC result in concentrate that eventually takes up space in the Tank Farm. Therefore, even small reductions in the total amount of DWPF recycle sent to the Tank Farm can result in space savings.

  The risks associated with these ideas include the costs, radiation concerns and remote replacement of equipment in an operating facility. Some of the recycle reduction ideas include:

  - purchasing new equipment for various DWPF transfer pumps to reduce flushes
  - installing a jumper in the Low Point Pump Pit to bypass the tank and eliminate multiple primes for each transfer
  - reducing the steam flow to the melter off-gas system.

CONCLUSION

In conclusion, waste storage space in the Tank Farms continues to be a major issue. However, the combined actions described above will adequately manage tank space and avoid the necessity of reusing old style tanks for storage capacity. The substitution of the above space management strategies for those contained in HLWSP, Rev. 10 does not significantly affect the HLW System production rates or cost profiles.

Implementation of strategy ideas will be tracked to ensure progress is being made in maintaining the tank space necessary to support mission requirements. The Tank Space Team's recommended strategy will be updated and discussed in detail in future revisions of the HLW System Plan as assumptions are validated or revised and as new process information becomes available. Tank space management techniques will continue to be highlighted and refined with all future revisions of the HLWSP.