Accession #: D196052112

Document #: SD-WM-ER-029

Title/Desc:
OPERATIONAL WASTE VOLUME PROJECTION

COMPLETE

ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 606102

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	3a. USQ Required?	4. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	J. N. Strode, Waste Tank Process Engineering, R2-11	[] Yes [X] No	9/22/95
	5. Project Title/No./Work Order No.: WM	6. Bldg./Sys./Fac. No.: 2750/200E	7. Approval Designator: N/A
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.): WHC-SD-WM-ER-029, Rev. 20	9. Related ECN No(s).: N/A	10. Related PO No.: N/A

11a. Modification Work	11b. Work Package No.	11c. Modification Work Complete	11d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)	N/A	N/A Cog. Engineer Signature & Date	N/A Cog. Engineer Signature & Date

12. Description of Change

This document updates Revision 20 by incorporating changed facility schedule assumptions, as well as waste generation rates and volumes which have occurred since the publication of Revision 20. All the values in this document will be updated several times per year.

13a. Justification (mark one)

Criteria Change	[X]	Design Improvement	[]	Environmental	[]	Facility Deactivation	[]
As-Found	[]	Facilitate Const	[]	Const. Error/Omission	[]	Design Error/Omission	[]

13b. Justification Details

See line 12 above.

14. Distribution (include name, MSIN, and no. of copies)

See attached distribution sheets.

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DATE SEP 26 1995

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A-7900-013-2 (11/94) GEF095

A-7900-013-1 (06/92)

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1): 606102

15. Design Verification Required	16. Cost Impact — ENGINEERING		16. Cost Impact — CONSTRUCTION		17. Schedule Impact (days)	
[] Yes	Additional	[] $	Additional	[] $	Improvement	[]
[X] No	Savings	[] $	Savings	[] $	Delay	[]

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]	Tickler File	[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		**ARCHITECT-ENGINEER**	
Cog. Eng. G. M. Koreski/J. N. Strode [signature]	9/21/95	PE	
Cog. Mgr. W. B. Barton [signature]	9/22/95	QA	
QA		Safety	
Safety		Design	
Environ.		Environ.	
Other	9/20/95	Other	
AM Umek, Director, TWRS Engineering [signature]	9/22/95		
JO Honeyman, Director, TWRS Disposal Program			
WE Ross, Manager, Tank Farm Transition Project [signature]	9/22/95	**DEPARTMENT OF ENERGY**	
		Signature or a Control Number that tracks the Approval Signature	
		ADDITIONAL	

RELEASE AUTHORIZATION

Document Number:	WHC-SD-WM-ER-029, REV 21
Document Title:	Operational Waste Volume Projection
Release Date:	9/26/95

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Kara Broz 9/26/95

Kara Broz

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SUPPORTING DOCUMENT

1. Total Pages 78 80

2. Title

Operational Waste Volume Projection

3. Number

WHC-SD-WM-ER-029

4. Rev No.

21

5. Key Words

Waste Volume Projection, Tank Space Management Board, Waste Volume Reduction, Double-Shell Tank, Evaporator, LERF

6. Author

Name: GM Koreski/JN Strode

Signature

Organization/Charge Code
74A10/N1260

7. Abstract

Waste receipts to the double-shell tank system are analyzed and wastes through the year 2015 are projected based on generation trends of the past 12 months. A computer simulation of site operations is performed, which results in projections of tank fill schedules, tank transfers, evaporator operations, tank retrieval, and aging waste tank usage.

This projection incorporates current budget planning and the clean-up schedule of the Tri-party Agreement. Assumptions were current as of June 1995.

8. RELEASE STAMP

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RECORD OF REVISION	(1) Document Number SD-WM-ER-029	Page 2

(2) Title
Operational Waste Volume Projection

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) Cog. Engr.	Authorized for Release (6) Cog. Mgr. Date
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RECORD OF REVISION

(1) Document Number: SD-WM-ER-029 | Page 1

(2) Title

Operational Waste Volume Projection

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17 RS	Incorporated per ECN ~~169259~~ 195548 SK (6-5-93)	G. M. Koreski J. N. Strode	G. T. Frater	4-21-93
18	Incorporated per ECN 603360	G. M. Koreski J. N. Strode	R. A. Dodd	
19 RS	Incorporated per ECN 189210	G. M. Koreski J. N. Strode	N. W. Kirch	4-26-94
20 RS	Incorporated per ECN 166505	G. M. Koreski J. N. Strode	N. W. Kirch	9/2/94

OPERATIONAL WASTE VOLUME PROJECTION

JUNE 1995

Prepared by

GM Koreski
JN Strode

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1.0 SUMMARY

The Operational Waste Volume Projection (OWVP) presents a basis for evaluating future Double-Shell Tank (DST) space through FY 2015. This report presents a projected range of tank needs which is used to generate recommendations regarding site activities, waste management activities, facility requirements, and the need to build additional double-shell tanks. This document presents the results of three distinct projections cases (Baseline, Ecology, and Alternate Acquisition Strategy Cases). Operating assumptions for the three cases were established prior to June 1995:

- o The Baseline Case presents projected DST needs based on TPA Fourth Amendment milestones, TWRS program planning, and the current operational assumptions. The Baseline Case does not require construction of additional DSTs through FY 2015.
- o The Ecology Case was requested by the Washington Department of Ecology in RCR comments dated January 17, 1995. This case adds increased Terminal Cleanout (TCO) waste generations, reduced spare space, the dilution of Tanks 101-SY and 103-SY in FY 1998 and 2000, respectively. This projection exceeds available space by one tank during the period FY 1999-2006.
- o The Alternate Acquisition Strategy Case presents projected tank space needs for preliminary assumptions received for waste disposal by private contractors. This projection saves tank space during the period FY 2004-2006 but would require a reduction in the SST solids retrieval rate to avoid exceeding available space by the end of FY 2007.

A comparison of the projected tank space needs required for the three projection cases is depicted in Figure 1. Key assumptions for the three projection cases are summarized in Table 1. Differences in assumptions have been highlighted. Detailed assumptions and space saving alternatives are presented later in this document. A brief summary of the risks associate with these projections is provided in Table 2. At a minimum, this DST space forecast will be updated annually with the latest information available regarding the estimated volume of waste requiring storage in the DSTs.

Areas Requiring Management Consideration

Facility waste minimization requirements initiated by the Tank Space Management Board (TSMB) helped to guarantee tank space availability prior to the 242-A Evaporator restart. However, considering the possibility of future tank space shortages, the Terminal Clean-out (TCO) and monthly waste generations will continually need to be minimized.

Should a tank space shortage occur during the projection period (Figure 1), the shortage could be solved using a combination of the following actions:

- o delay the Single-Shell Tank (SST) stabilization
- o delay Tank 101-SY and 103-SY dilution and pretreatment
- o delay the SST solids retrieval
- o accelerate pretreatment and vitrification of waste
- o accelerate NCAW and NCRW waste consolidation actions
- o construct new double-shell tanks
- o establish Phase II contract terms for the Alternate Acquisition Strategy Case to require rates of retrieval and processing equivalent to TPA rates

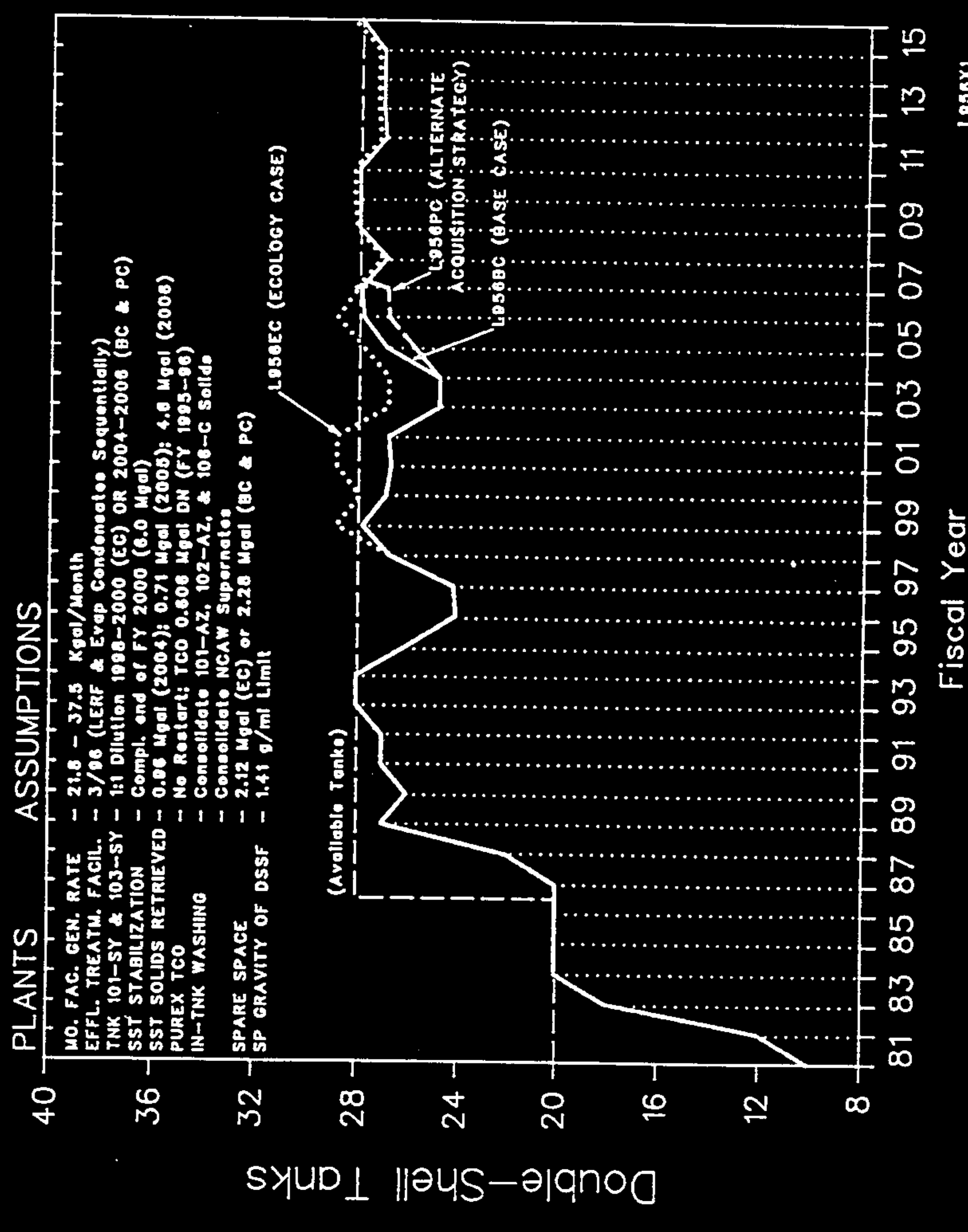


Figure 1. Comparison of Tank Requirements For The 6/95 Projection Cases

Table 1. Summary of Assumptions For the June 1995 Projection Cases (references in Sect. 3)

Facility or Project	Baseline Case (L956BC) Assumptions	Ecology Case (L956EC) Assumptions	Alternate Acquisition Strategy Case (L956PC) Assumptions
Total Monthly Facility Generations	21.8-37.5 Kgal/month	21.8-37.5 Kgal/month	21.8-37.5 Kgal/month
PUREX TCO	TCO FY95-96 (0.61 Mgal DN)	TCO FY95-96 (0.61 Mgal DN)	TCO FY95-96 (0.61 Mgal DN)
B Plant TCO	TCO FY97-01 (0.45 Mgal DN)	TCO FY97-01 (0.45 Mgal DN)	TCO FY97-01 (0.45 Mgal DN)
100N Area TCO	TCO FY96 (1.5 Mgal DN)	TCO FY96 (1.5 Mgal DN)	TCO FY96 (1.5 Mgal DN)
100K Area TCO	TCO FY98 (0.53 Mgal DN)	TCO FY97-02 (6.0 Mgal DN)	TCO FY98 (0.53 Mgal DN)
105 F & H Basin Cleanout	FY 1998 (0.25 Mgal DN)	FY 1998 (0.25 Mgal DN)	FY 1998 (0.25 Mgal DN)
Evaporator Restart	04/1994; LERF 13 Mgal	04/1994; LERF 13 Mgal	04/1994; 13 Mgal LERF
Liquid Effluent Treatment Facility Startup Rate TOE	 11/1995 150 gpm 70%	 11/1995 150 gpm 70%	 11/1995 150 gpm 70%
SST Stabilization Porosity Complexed SWL Volume Pumped	 61% 2.55 Mgal ~6.0 Mgal by end of FY 2000	 61% 2.55 Mgal ~6.0 Mgal by end of FY 2000	 61% 2.55 Mgal ~6.0 Mgal by end of FY 2000
PFP Stabilization Run Startup	FY 1995-2006	FY 1995-2006	FY 1995-2006
Tank 101-SY Dilution (Date)	No Dilution	1:1 Dilution (1998)	No Dilution
Tank 103-SY Dilution (Date)	No Dilution	1:1 Dilution (2000)	No Dilution
SST Solids Retrieval 106-C solids (start; receiver tank) SST Solids Retrieval Start Rate SST Waste Retrieval Complete SST Site Closure Complete	 FY 1997; Tank 102-AY 09/2003 0.2 Mgal (0.8 Total) in FY 2004; 0.3 Mgal (1.2 Total) in FY 2005 FY 2018 FY 2024	 FY 1997; Tank 102-AY 09/2003 0.2 Mgal (0.8 Total) in FY 2004; 0.3 Mgal (1.2 Total) in FY 2005 FY 2018 FY 2024	 FY 1997; Tank 102-AY 09/2003 0.2 Mgal (0.8 Total) in FY 2004; 0.3 Mgal (1.2 Total) in FY 2005 FY 2018 FY 2024
LLW Pretreatment Facility startup	12/2004	12/2004	10/2000
LLW Pretreatment Rate (Mgal/Yr)	3.43 in FY 2005 6.87 in FY 2006 10.6 in FY 2007	3.43 in FY 2005 6.87 in FY 2006 10.6 in FY 2007	3.1 FY 2001-2009 19.5 FY 2010 on
LLW Operational Tanks	3 in FY 2005; 4 in FY 2006	3 in FY 2005; 4 in FY 2006	3 in FY 2001
LLW Vitrification	06/2005; 3.43 Mgal in 2005	06/2005; 3.43 Mgal in 2005	10/2000; 1 Mgal in 2001
In-Tank Washing (FY 1995-2000)	Consolidate all NCAW, 101-AY, 102-AY & 106-C solids. Consolidate all NCAW supernates.	Consolidate all NCAW, 101-AY, 102-AY & 106-C Solids. Consolidate all NCAW supernates.	Consolidate all NCAW, 201-AY, 102-AY & 106-C Solids. Consolidate all NCAW supernates.
HLW Enhanced Sludge Washing	06/2008	06/2008	01/2011
HLW Vitrification startup	12/2009	12/2009	12/2011
Evaporation Limit for Wastes--SpG	1.41	1.41	1.41
Spare Space	2.28	2.12	2.28
Contingency Tank	None	None	None
Loss of DST Space	None	None	None

Table 2. Risk Assessment Summary for Waste Volume Projections

RISK ASSESSMENT SUMMARY FOR WASTE VOLUME PROJECTIONS									
Technical/Program Basis for Waste Volume Projections	Confidence of Basis Being Accurate			Waste Volume Impact if Wrong			Consequence if Assumption Wrong		COMMENTS
	HIGH	MED	LO	MAJOR	MINOR	QUANTITY	MAJOR	MINIMAL	
Remaining SWL pumping volume is ~6.0 Mgal		X		X		Dependent on magnitude of change	X		Delay TPA milestones; Large concentrated volume; 45% porosity volume is ~5.1 Mgal
CC waste and TRU sludge in Tank 102-SY are compatible			X	X		Dependent on magnitude of change	X		Could delay SWL pumping TPA milestones
242-A Evaporator available without an outage to 2015		X		X		Dependent on magnitude of change	X		Tank Space Projections based on concentrated volumes
Evaporation limit for new DSSF will be SpG of 1.41		X		X		Dependent on magnitude of change	X		Reduction in SpG could be required by safety issues
In-Tank washing - all NCAW solids in 1 tank; all supernates in 1 tank	X				X	Dependent on magnitude of change		X	Could pospone in-tank washing which could delay HLW vitrification
Facility generations will not exceed Base Case levels		X			X	Dependent on magnitude of change		X	Small concentrated volume; could delay site cleanup
Facility TCO volumes: PUREX < 0.606 Mgal B Plant < 0.450 Mgal 100 N <1.5 Mgal		X			X	Dependent on magnitude of change		X	Could delay site cleanup
No loss of DST space		X			X	· 1 mgal/tank	X		
LLW pretreatment starts in FY05; 10.6 Mgal/year		X		X		Dependent on magnitude of change	X		Could delay SST solids retrieval
Crossite transfer lines are available		X		X		Dependent on magnitude of change	X		Could delay SWL pumping TPA milestones and/or site cleanup
Use Grout in emergencies to free up 2-3 Mgal of space			X	X		Dependent on magnitude of change	X		DOE and public acceptance
No volume set aside for upsets or new streams			X		X	Dependent on magnitude of change	X		Consequences depend on volume, composition, and timing

2.0 INTRODUCTION

2.1 Purpose

The purpose of the Operational Waste Volume Projection (OWVP) is to present a basis for evaluating future Double-Shell Tank (DST) needs to meet Tri-Party Agreement Milestone (TPA) M-46-00. This report presents a projected range of tank needs which is used to generate recommendations regarding site activities, waste management activities, facility requirements, and the need to build additional DSTs. This document presents the results of three projections cases (Baseline, Ecology, and Alternate Acquisition Strategy Cases) which represent varying degrees of tank space demands. The Baseline Case is intended to present tank space needs based on TPA Fourth Amendment milestones, TWRS program planning, and current operational assumptions. The "Ecology Case" was completed using assumptions requested by the Washington Department of Ecology. The Alternate Acquisition Strategy Case uses preliminary assumptions for waste disposal by private contractors. Operating assumptions for the three cases were established prior to June 1995. Need dates for new DST construction, tank retrievals, facility schedules, waste generation reductions, conflicts in meeting TPA milestones (WDOE, 1994), and funding priorities can then be reviewed in relation to tank space availability.

2.2 Methodology

The process followed in preparing an OWVP is shown in Figure 2, below.

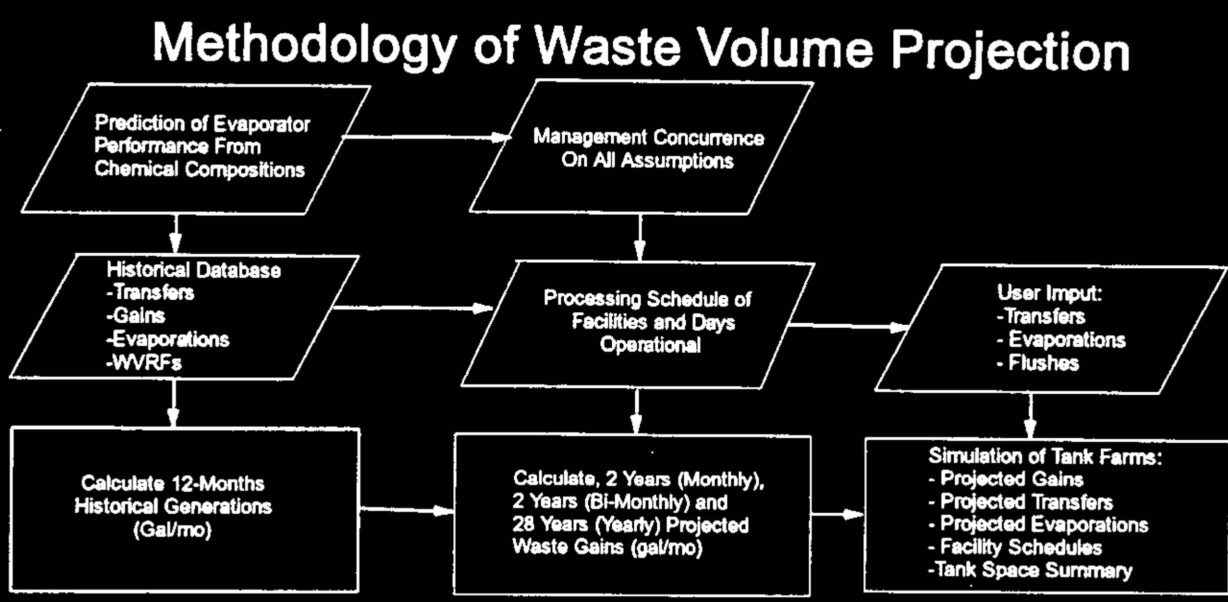


Figure 2. Methodology of the OWVP

The process of updating the OWVP begins with the request for updated facility or project "assumptions" from each of the operating facilities and projects that will contribute waste to DST inventory. The term "assumption" in this document refers to engineering inputs or bases supplied by the facilities based on their future operational plans (determined by budget, DOE directive, TPA milestones, etc.). Typical assumptions include operating schedules, waste generation rates, stream compositions, modes of operation, etc. The operating facilities and projects provide estimates of volume, composition, and radionuclide content data for each distinct waste stream exiting the facility. In addition to the projected facility waste generation rates, the processing schedules of each of the plants are factored into the projection. For the Plutonium-Uranium Extraction (PUREX) facility, B Plant, and 100N Area, the projected volumes of waste generated from TCO are estimated and entered. For the Plutonium Finishing Plant (PFP), 300 Area, 400 Area, and Tank Farms, monthly waste generations are entered from facility inputs and/or actual observed generation rates. These projected waste generation rates and plant schedules are used to project waste volumes that each plant will be producing per month or year. The composition data is used to calculate Waste Volume Reduction Factors (WVRFs) and to determine waste segregation requirements (due to chemical, radionuclide, or heat content). The WVRF (Riley, 1988) is defined as the percent of water (by volume) that can be removed from a waste stream to achieve a certain interim waste form such as double-shell slurry feed. From the facility assumptions, a matrix of basic assumptions for the three cases to be incorporated into the OWVP projections were prepared and presented to WHC management and program office for approval.

Once the projection cases have been approved, the database of past waste gains, transfers, and evaporations is updated with data from the most recent months of Tank Farm operations. The early years of the projection are simulated in more detail than the later years. In the first period of the projection, monthly waste volumes are predicted. For the next period of the projection, bi-monthly waste volumes are predicted. For the last years of the projection, yearly waste volumes are predicted.

The processing sequence in the simulation is designed to model the actual activities in the tank farms. After a dilute receiver tank is filled with waste, the contents are transferred to an available holding tank. The dilute waste must remain in the holding tank for at least four months to allow for sampling and characterization before it can be transferred to the 242-A Evaporator feed tank (Tank 102-AW) for evaporation. After dilute waste is concentrated in the 242-A Evaporator, it is sent to a slurry receiver tank (Tank 106-AW) as Double-Shell Slurry Feed (DSSF) which will eventually be disposed of through the Low-Level Waste (LLW) pretreatment and vitrification process.

For the Baseline and Ecology Cases, the processing sequence for the Neutralized Current Acid Waste (NCAW) solids is for the solids to be washed in-tank (MacLean, 1995) and then disposed of in the High-Level Waste (HLW) vitrification plant. The separated supernates and washes will be pretreated to form high-level and low-level streams. The HLW vitrification facility will incorporate high-level and transuranic (TRU) wastes into a glass matrix for disposal. The low-level stream will be sent to LLW vitrification for final disposal.

3.0 GENERAL FACILITY DESCRIPTIONS AND ASSUMPTIONS

A brief description of the facilities and projects pertinent to this projection are listed in the following section. Facility operating dates, waste generation volumes, WVRFs, flushes, and other pertinent assumptions are described. This information has been summarized for each of the three cases in Table 8, which is included at the end of this section. The spreadsheet for the Baseline Case (Section 5.1) lists the waste generations for each year for facilities that presented a range of waste generation rates (e.g., S Plant and T Plant).

3.1 B Plant

B Plant was constructed in 1945 to recover plutonium by the bismuth phosphate process. The facility was refurbished in 1967 to recover ^{90}Sr and ^{137}Cs byproducts from the high level waste tanks (Kutsch, 1995). In 1974, the Waste Encapsulation and Storage Facility (WESF), was constructed on the west end of B Plant to support B Plant's mission. WESF's original mission was to encapsulate, cool, store, and monitor the high heat generating cesium and strontium capsules. The byproduct recovery mission was completed in FY 1984 and B Plant was once considered for waste pretreatment. B Plant is no longer considered a viable option for pretreatment of Hanford tank waste and is presently transitioning to shutdown.

B Plant discharges a low-level miscellaneous waste stream (dilute non-complexed waste) resulting from cell drainage, vessel clean-out, condensate collection, etc. Future TCO activities will generate wastes that can be separated into three categories (Smith, 1994): 1) aqueous phase waste generated during organic solvent removal (may be complexed waste); 2) dilute non-complexed (DN) waste; and 3) uncharacterized waste resulting from vessel flushing. Uncharacterized wastes will be characterized when they are produced.

B Plant/WESF projected waste generations for the Baseline Case (Kutsch, 1995b) will generate approximately 5 Kgal/month of miscellaneous waste until plant stabilization has been completed. Cleanout and stabilization of B Plant is estimated to occur from FY 1997-2001 and will generate approximately 450 Kgal of additional dilute non-complexed TCO wastes (Kutsch, 1995b). When B Plant has completed TCO there will continue to be a waste stream from WESF. WESF will continue to generate approximately 5 Kgal/year of waste from 2002-2028. The WVRF to evaporate either B Plant miscellaneous or TCO waste to DSSF is 99 (Sederburg, 1995). No flushes are anticipated for B Plant miscellaneous or TCO streams.

All three cases in this document were based on the waste generations described above. The upper waste rate supplied by B Plant engineers (Kutsch, 1995b) would increase the B Plant/WESF monthly waste generation from 5 Kgal/month to approximately 8 Kgal/month.

3.2 242-A Evaporator and LERF

The 242-A Evaporator was restarted on April 15, 1994. To understand the projection model for the 242-A Evaporator, it is necessary to understand the waste flow during evaporator operation and the simulation model. Waste from the dilute holding tanks are transferred into the evaporator feed tank (Tank 102-AW). Waste in the feed tank is then transferred to the 242-A Evaporator for boil-down. In the evaporator operation, four to six months is required for wastes to be sampled and analyzed per Evaporator DQO requirements (Von Bargen, 1995) before they can be evaporated.

- This projection model assumed that the 242-A Evaporator would operate in a "Linked Run" process mode (Guthrie, 1993). A "Linked Run" is a continuous operation of the 242-A Evaporator, made possible by simultaneously transferring from the DST's to the Evaporator feed tank (Tank 102-AW).

- A period of four to six months is required from the time a tank is filled with dilute wastes before the waste can be evaporated. This period allows time for sampling and analysis, documentation, and facility preparation (Guthrie, 1993). To minimize projected tank space needs, this computer simulation allowed four months.

- In the computer simulation, dilute waste is transferred to the evaporator feed tank (Tank 102-AW) for evaporation. Provided the waste has not reached its concentration limit, the monthly evaporation is continued until the maximum Waste Volume Reduction (WVR) for the month is achieved.

- The desired WVR for each 242-A Evaporator campaign is determined by boil-down studies, computer simulation, and/or process control sampling. The concentration of waste increases after each pass through the Evaporator until it reaches a concentration level consistent with engineering studies. The waste volume projection model of the 242-A Evaporator operation used in these projections cases produced DSSF with a specific gravity of 1.4-1.5. Upon reaching the desired concentration level, the concentrated waste is transferred to the evaporator receiver tank (Tank 106-AW). At the end of a campaign or when Tank 106-AW has been filled, DSSF is transferred to a holding tank.

- A 13 million gallon storage facility will be used to store evaporator condensate (Williams, 1994). This facility is called the Liquid Effluent Retention Facility (LERF).

- Based on performance during the first three evaporator campaigns, approximately 1.26-1.3 gallon of condensate will be sent to LERF for every gallon of Waste Volume Reduction (WVR). Based on a factor of 1.3 gallon of condensate/gallon of WVR, the Evaporator should be able to achieve about 10 million gallons of WVR before the LERF is full. Current evaporator campaign schedules would not fill the LERF to capacity before the Liquid Effluent Treatment Facility starts in November 1995.

- During each campaign the 242-A Evaporator will be able to process 1,000 - 2,000 Kgal per month (Guthrie, 1993). Two months of down time are allowed in the simulation between campaigns. The down time allows transfer of the concentrated waste from Tank 106-AW to a slurry holding tank, staging the dilute waste designated for the next campaign, and set-up of the 242-A Evaporator.

- An average evaporation rate of 500-750 Kgal/month (Guthrie, 1993) is used in this simulation taking in to consideration:
  - the 242-A Evaporator historical processing rates
  - downtime between campaigns
  - waste characterization
  - staging and tank transfers

- The simulation used in this projection evaporates all dilute wastes to a concentrated interim storage form in the same year that a tank has been filled. This assumption is valid if the evaporator is operating and the yearly waste generation rate has not exceeded the annual WVR limit of the evaporator. Historically, dilute wastes were concentrated to near the aluminate boundary which would produce concentrated wastes with a specific gravity which could range from 1.3 to 1.67. However, it has been noted that all of the DSTs currently on the Flammable Gas Watch List (i.e., tanks with safety concerns related to hydrogen build-up) have specific gravities greater than 1.4 (Reynolds, 1994). To avoid production of future Flammable Gas Watch List tanks, it has been proposed that all future waste concentrations should be limited to a specific gravity of 1.41 unless additional technical evaluation shows flammable gas will not build-up (Fowler, 1995a and Fowler, 1995b).

  The waste volume projection model of the 242-A Evaporator operation used in previous projections, typically produced DSSF with a specific gravity of 1.50-1.55. Reducing these wastes to a specific gravity of 1.41 could increase waste storage volumes by approximately 22-35 percent, depending on the chemical composition of the waste. This document projected DST needs based on the evaporation of wastes to a specific gravity of 1.41.

- The first Evaporator Campaign (94-1) started on April 15, 1994 and evaporated the wastes stored in Tanks 102-AW, 106-AW, and 103-AP. This campaign achieved approximately 2.42 Mgal of WVR.

- The second Evaporator Campaign (94-2) started on September 22, 1994 and evaporated the wastes stored in Tanks 102-AW, 106-AW, 101-AP, 107-AP, and 108-AP. This campaign achieved approximately 2.79 Mgal of WVR.

- The third Evaporator Campaign (95-1) started on June 8, 1995 and evaporated the wastes stored in Tanks 102-AW, 106-AW, 107-AP, and 108-AP. This campaign achieved approximately 2.16 Mgal of WVR.

- This projection assumed that the fourth evaporator campaign would start in June 1996 and evaporate complexed wastes stored in Tanks 101-AY and 106-AN. The fifth evaporator campaign was assumed to start in September 1996 to evaporate up to one and one-half million gallons of dilute non-complexed waste.

- The Evaporator will become current in 1996 and will remain current. To remain current, the Evaporator will be operated annually to evaporate all dilute wastes.

- Previous projections assumed that the 242-A Evaporator would require a 1 year outage for maintenance and or upgrades every 10 years based on a 10 year design life of the 242-A Evaporator (WHC-EP-0342). This projection assumed there would not be on outage before FY 2015.

- Evaporator training runs prior to evaporator operation were estimated to add approximately 50 Kgal/year (Guthrie, 1995). The training run in April 1995, added 57 Kgal.

- Evaporator flushing after each campaign was previously projected to add 35 Kgal/campaign (Haigh, 1992). Actual flushes for the first three campaigns completed since April 1995 have varied from 27 to 58 kgal/campaign.

- Projected waste generations for the 242-A Evaporator due to training/flushing for FY 1995 evaporator operations was 85 Kgal. For the years 1996-1999, it was estimated that 1 to 2 campaigns would be required each year based on waste generations, segregation requirements, and tank space availability. The additional operations would be needed to evaporate the anticipated increased SWL (complexed and non-complexed) and TCO wastes. Based on these considerations, the projected waste generation for the evaporator was increased to 100 Kgal/year for the period 1996-1999. From FY 2000 on, the estimated evaporator waste generation was reduced to 85 Kgal/year. The WVR for evaporation of these flushes to DSSF was 99 (Sederburg, 1995).

3.3 Grout

- No additional Grout Vaults are scheduled to be poured at the Hanford site. TWRS program planning requires that all LLW will be pretreated through a LLW pretreatment facility and eventually vitrified in a LLW vitrification plant. Tanks that were originally designated and set aside as grout feed tanks were used for other purposes.

3.4 Liquid Effluent Treatment Facility

- A new facility called the Liquid Effluent Treatment Facility (LETF) will be operational in November 1995 to process the stored evaporator condensate from the LERF basins and newly generated evaporator condensate sequentially (Godfrey, 1995). This facility will be designed with 40 to 150 gallon/minute variable flow rate. It is assumed that this facility will ramp up from a 24 percent Total Operating Efficiency (TOE) to 72 percent TOE over a four month period. The maximum anticipated processing rate of 72 percent TOE will be reached in March 1996.

3.5 PFP

The Plutonium Finishing Plant (PFP) is a facility in the 200 West Area which houses the processes and supporting operations for (Bergquist, 1995):

1) converting plutonium nitrate and oxide to other storable residues (STANDBY);
2) dissolution of solid forms of plutonium (STANDBY);
3) stabilization of reactive solid residues by muffle furnace calcination (OPERATIONAL);

4) shipping, receiving and storage of special nuclear materials (OPERATIONAL);
5) analytical and development laboratories (OPERATIONAL);
6) treatment and handling of PFP liquid wastes destined for tank farms and the 216-Z-20 crib (OPERATIONAL).

The process and schedule for stabilization of PFP (Bergquist, 1995) have not been defined. An Environmental Impact Statement (EIS) will have to be completed before PFP stabilization can occur. PFP is currently in an operations standby condition with maintenance and laboratory work on-going, but with the major process lines (Plutonium Reclamation Facility (PRF) and Remote Mechanical C Line (RMC)) in standby pending the outcome of the EIS (Backlund, 1994). The schedule and nature of the PFP stabilization is dependent on the outcome of the EIS (Record of Decision, June 1996). The volume of waste anticipated to be produced for the Baseline Case is developed from the existing waste generation rate at PFP (300 untreated gallons/month), and the anticipated use of a direct denitration vertical calciner currently being developed and tested by the development laboratories. The vertical calciner (Bergquist, 1995) is the most promising technology to replace the PRF and RMC for plutonium residue stabilization and facility clean out. The Baseline Case would generate a total of 70 Kgal of waste from 1995 through 2006 (Bergquist, 1995). The WVRF to evaporate PFP wastes to DSSF is 81 (Sederburg, 1995). Flush volumes for PFP stabilization waste streams is 22 per cent (flushes of waste transfer lines from PFP to 244-TX and from 244-TX to Tank 102-SY).

Although the waste generations used for the Ecology and Alternate Acquisition Strategy Cases were the same as those used for the Baseline Case, generation volume for PFP stabilization could run as high as 360 Kgal for other stabilization methods (Bergquist, 1995). PFP waste generations and approximate percent solids are listed below for the different lines (Barrington, 1991):

% Solids in PRF waste	3.5%
% Solids in RMC waste	4.4%
% Solids in lab waste	4.5%

3.6 PUREX

The Plutonium Uranium Extraction (PUREX) Facility was used to separate irradiated N Reactor fuel into plutonium nitrate, uranyl nitrate hexahydrate (UNH), neptunium nitrate, and waste products. The main processing operations involved dissolution of cladding and irradiated fuel, solvent extraction and conversion of plutonium nitrate to plutonium oxide. Acid recovery, solvent treatment systems, and off-gas treatment supported the major processes.

Westinghouse Hanford Company has been directed by the Department of Energy (DOE) to proceed with deactivation of PUREX. A detailed plan for the deactivation of the PUREX facility was completed in the fourth quarter of FY 1993. Deactivation of PUREX started in April 1994 and will continue through FY 1997 (Lohrasbi, 1994) with most of the waste being sent to DSTs by the end of FY 1996. It is assumed that all waste transfers from PUREX to the DST system will cease once deactivation has been completed.

Three types of waste are stored at PUREX which would normally be transferred from PUREX to DSTs (Lohrasbi, 1994): (1) low level non-dangerous wastes, (2) waste from tanks D5 and E6 (TRU wastes). and (3) nitric acid. The amount of waste to be transferred to DSTs for all three projection cases was projected to be 606 Kgal of dilute wastes (Lohrasbi, 1995) from January 1995 to the end of TCO. Based on the average waste composition presented for PUREX TCO wastes, the WVRF for evaporation of PUREX TCO wastes to DSSF is 99 (Sederburg, 1995). Flush volumes for PUREX TCO waste streams is 10 per cent.

3.7 S Plant

S Plant (or 222-S Labs) is a dedicated laboratory facility. The Laboratory currently provides analytical chemistry services in support of Westinghouse Hanford Company's processing plants and tank characterization. Emphasis is on waste management processing plants, environmental monitoring programs, B Plant, Tank Farms, 242-A Evaporator, Waste Encapsulation Storage Facility (WESF), PUREX Facility, Plutonium Finishing Plant (PFP), research support activities, and essential materials. Most of the radioactive liquid waste generated at the laboratory complex originates from analytical activities performed within the 222-S Laboratory in support of tank characterization (Hall, 1995). Radioactive and radioactive hazardous (mixed) wastes generated by the 222-S Laboratory is discharged to the 219-S Waste Handling Facility. Dilute, non-complexed wastes are currently being transported to 204-AR vault via tanker truck. Projected S Plant monthly waste generations rates (Hall, 1995) varied from 1.7 to 2.5 Kgal/month for the Baseline Case for the period FY 1995 to 2028 (waste volume generations for each year are shown in the spreadsheet for the Baseline Case--Section 5.1). All three projection cases used the same waste generation rates. Based on the waste composition presented for 222-S Laboratory wastes, the WVRF for evaporation of 222-S miscellaneous wastes to DSSF is 99 (Sederburg, 1995). Flush volumes for 222-S waste streams is 22 per cent.

3.8 Salt Well Liquid Pumping

Salt Well Liquid (SWL) pumping will occur for single-shell tanks (SSTs) which have 50,000 gallons or more of drainable interstitial liquid. Pumping is scheduled to stop when the output rate decreases to 0.05 gallons per minute. SWL pumping assumptions for all three projection cases are listed below:

- The three cases in this projection used a 61 percent saltcake porosity/16 percent sludge porosity resulting in a remaining volume of 6.0 million gallons (Brown, 1995) of SWL to be pumped from FY 1995 through the end of FY 2000 to meet TPA milestone M-41-00. This represents a 2.4 million gallon increase in the volume of SWL to be pumped as compared to the previous Baseline Case from Revision 20 of this document. The WVRF for evaporation of non-complexed SWL to DSSF is 47 (Sederburg, 1995). The WVRF for evaporation of complexed SWL to complexant concentrate (CC) is 10 (Sederburg, 1995).

- Flushing of the salt well liquid and transfer lines will generate approximately 1.6 Mgal (26 percent) of water (Brown, 1995). The WVRF used for this flush is 99 (Sederburg, 1995).

- Approximately 1.84 Mgal (30 percent) of the total SWL volume is complexed (Brown, 1995).

- The pumping schedule presented in Table 3 is based on the interim stabilization change package presented to DOE-RL (Lee, 1993). Total volumes were taken from Brown (1995) at 61% saltcake porosity/16% sludge porosity. It is assumed that two-thirds of the pumpable volume in a SST will be pumped in the first half of the pumping schedule with the remaining one-third pumped in the second half (Boyles, 1994).

Table 3. Salt Well Pumping Schedule for 61% Saltcake/16% Sludge Porosity

Salt Well Pumping Schedule for 61% Saltcake/16% Sludge Porosity (Brown, 1995)

FISCAL YEAR	EAST AREA		WEST AREA		TOTALS
	DN	DC	DN	DC	
1989	55 KGAL	0 KGAL	0 KGAL	17 KGAL	72 KGAL
1990	44 KGAL	0 KGAL	0 KGAL	0 KGAL	44 KGAL
1991	227 KGAL	0 KGAL	0 KGAL	0 KGAL	227 KGAL
1992	121 KGAL	0 KGAL	0 KGAL	0 KGAL	121 KGAL
1993	0 KGAL	0 KGAL	37 KGAL	0 KGAL	37 KGAL
1994	189 KGAL	0 KGAL	32 KGAL	0 KGAL	221 KGAL
1995	154 KGAL	52 KGAL	0 KGAL	0 KGAL	206 KGAL
1996	324 KGAL	195 KGAL	606 KGAL	39 KGAL	1164 KGAL
1997	154 KGAL	448 KGAL	1270 KGAL	483 KGAL	2355 KGAL
1998	36 KGAL	229 KGAL	635 KGAL	641 KGAL	1541 KGAL
1999	0 KGAL	188 KGAL	255 KGAL	237 KGAL	680 KGAL
2000	0 KGAL	0 KGAL	38 KGAL	18 KGAL	56 KGAL
TOTALS	1304 KGAL	1112 KGAL	2873 KGAL	1435 KGAL	6724 KGAL

Total Amount of SWL to be pumped from FY 1995-2000 is approximately 6 Mgal.

- Tank 101-AN was designated as the East Area dilute non-complexed SWL receiver tank.

- Tank 101-AY is currently designated as the East Area complexed SWL receiver tank. The contents of Tank 101-AY are scheduled to be pumped to Tank 105-AP in late FY 1995 to allow Tank 101-AY to be used for in-tank washing.

- Pumping SWL in West Area presents special problems due both to the limited tank space available and due to the transuranic (TRU) heel in Tank 102-SY. Tanks 101-SY and 103-SY contain complexed waste and are also designated as Watch List Tanks. Addition of waste to Watch List tanks is prohibited unless a safer alternative cannot be found.

Therefore, Tank 102-SY was designated as the West Area SWL receiver for both non-complexed and complexed SWL starting in FY 1996. Tank 102-SY contains approximately 133 Kgal of TRU solids (Table 7) that are not scheduled to be retrieved until 12/1998 (Strode, 1995a). Historically, complexed waste and TRU wastes have been segregated to minimize the amount of waste requiring more expensive disposal and to comply with U.S. Department of Energy (DOE) Order 5820.2A. The Hanford Site has implemented this order by segregating waste that was considered complexed (greater than 10 grams/liter total organic carbon) from TRU waste sludge (Reynolds, 1995). The schedule presented in Table 3 would require pumping complexed SWL over the sludge in Tank 102-SY in order to meet TPA milestones for the years 1995-1999. Studies are being conducted to resolve this issue. Some options include--delaying complexed SWL pumping in West Area until Tank 102-SY solids are retrieved; accelerating the retrieval of the TRU solids from Tank 102-SY; dilution and retrieval of the waste from either Tank 101-SY or 103-SY to free up additional tank space; conduct experiments to prove the complexed SWL can be added to the TRU solids in Tank 102-SY without solubilizing the TRU; or use a DCRT to pump complexed SWL to East Area without sending the waste to Tank 102-SY. In this projection, the complexed wastes are shown being pumped to Tank 102-SY to meet the TPA schedule.

3.9 Single-Shell Tank Solids Retrieval

- The TPA start date for retrieval of Tank 106-C (M-45-03A) is October 1997 but this projection assumed that the start date for retrieval of Tank 106-C would be October 1996 to satisfy Safety Initiative 6e (Wang, 1994 and Grumbly, 1993). Retrieval of Tank 106-C solids will require approximately a 3:1 ratio of dilution water to solids (Estey, 1994). Solids retrieved from Tank 106-C will be stored in Tank 102-AY.

- Approximately 12.2 Mgal of sludge and 23.4 Mgal of saltcake will be retrieved from SSTs (Hanlon, 1995). Dilution of these solids for retrieval and pretreatment results in a total of approximately 139 Mgal (Shelton, 1995).

- Retrieval of the remaining solids from all 149 SSTs will begin in September 2003 (M-45-03-T1) and be completed by the end of FY 2018. Saltcake will be diluted to 5 M Na and sludge will be diluted to 10 weight percent solids. Approximately a 3:1 ratio of dilution water to solids will be required for the retrieval of the remaining SST solids. It is further assumed that all solids will be removed from the SSTs and that SST site closure will be complete by FY 2024 (M-45-06).

- The Baseline and Ecology projection cases assumed that SST solids retrieval rates would be at a relatively slow rate in FY 2004-2005 to allow LLW pretreatment time to free up DST space by pretreating and vitrifying DSSF wastes. The retrieval volume schedule used for the three projection cases in this document were developed from the "2C3-087" retrieval/pretreatment option (Certa, 1995 and Orme, 1995a).

Retrieved volumes for the SSTs were obtained from a site developed database (Shelton, 1995). Use of this information resulted in approximately 0.96 Mgal of retrieved SST solids in 2004; 0.71 Mgal of retrieved SST solids in 2005; 4.6 Mgal of retrieved solids in 2006; and 6.7 Mgal of retrieved solids in 2007. Note: the remaining retrieved solids volumes are shown in the spreadsheet for the Baseline Case (Section 5.1).

o The Alternate Acquisition Strategy Case used the same SST solids retrieval rate thru FY 2005. From FY 2006 on, the private contractors would integrate the processing and retrieval rates capacities.

3.10 Solid Waste Trench 31 Leachate

A leachate collected from the mixed waste landfill (Trench 31). The maximum daily leachate volume is estimated to be 110,000 gallons from the 24 hour/25 year precipitation event (McKenney, 1994). There is only a remote chance that this waste stream will be transferred to DSTs and this stream has not been included in any of the three projection cases.

3.11 T Plant

T Plant's primary mission is decontamination and treatment of radiologically and chemically contaminated waste and equipment located throughout the Hanford site (Crane, 1995). T Plant also provides inspection and repackaging services to various Hanford facilities as well as the certification (hydrostatic leak testing) of the railcars used to transport liquid wastes to Tank Farms. The 2706-T Low-Level Decontamination Facility (where low-level equipment decontamination is performed) is an approved decontamination facility that commenced operation in September 1994. Limited 221-T canyon decontamination activities (primarily Tank Farms long-length contaminated equipment) may also be initiated in 1995.

T Plant is currently testing new decontamination techniques (ice blasting and CO_2 decontamination systems) which have reduced liquid waste generations from those reported previously. Dilute, non-complexed wastes collected at T Plant during decontamination, repackaging, condensate collection, or railcar certification are currently being transported to 204-AR vault via railcar. These wastes contain approximately 5 % solids (Jenkins, 1994). Projected T Plant monthly waste generations (Crane, 1995) were based on a combination of anticipated work loads and actual observed generation rates and ranged from 0.13 Kgal/month to nearly 15 Kgal/month for the period FY 1995 through 2028 (waste volume generations for each year are shown in the spreadsheet for the Baseline Case--Section 5.1). All three projection cases used the same generation rates. The WVRF for evaporation of T Plant miscellaneous wastes to DSSF is 99 (Sederburg, 1995). Flush volumes for T Plant waste streams is 22 per cent.

3.12 Tank Farms

There are currently 28 double-shell tanks (DSTs) used to receive, store, and evaporate the liquid wastes generated at the Hanford facilities to an interim waste form. The interim waste form (e.g., DSSF) is currently stored in tank farms awaiting pretreatment and vitrification for final disposal. Tank farm waste generation sources and operational considerations are listed below for the aging and non-aging waste tanks. Tank Farm waste generations are primarily from line, cross-site, and air-lift circulator flushes.

Aging Double-Shell Tanks

Four of the DSTs (AY and AZ farms) are designated as aging waste tanks that were designed to store high-heat wastes (e.g., NCAW wastes or wastes containing high-heat loads due to the presence of ^{90}Sr or ^{137}Cs). The aging waste tanks are equipped with condensers and air-lift circulators. The purpose of the condensers is to handle the vapors from primary tank vent systems when hot liquid is present. Condensates are collected in catch tanks (e.g., 151-AZ, 152-AX, or TK-417) and returned either to an aging waste tank or to a dilute receiver tank. The air-lift circulators aid in suspending NCAW solids and in heat removal. Air-lift circulators require periodic flushing to prevent clogging.

Aging waste tank operation assumptions are as follows:

- Aging waste tanks can be used for storage of dilute non-aging waste. However, non-aging waste tanks cannot be used for storage of aging wastes.

- It is assumed that there will be no additional aging waste produced by the Hanford facilities. However, certain wastes containing high ^{90}Sr or ^{137}Cs contents may require storage in aging waste tanks due to their radioactivity.

- Single-shell tank (SST) solids retrieved from Tank 106-C will be stored in an aging DST (Tank 102-AY) due to the high heat contents of the solids.

- It is assumed that the in-tank washing activities will commence in FY 1995 to supply the initial feed for the High Level Waste (HLW) vitrification facility. The first step in all the in-tank washing scenarios involves the decanting and transfer of the supernate from Tank 101-AZ to Tank 101-AY (contents previously transferred to AP Farm). The decanted aging waste supernate from Tank 101-AZ will require storage in an aging waste tank due to its heat content. The revised in-tank washing activities used for this projection would result in combining all NCAW solids plus the Tank 106-C solids in one aging waste tank. The NCAW supernates from Tanks 101-AZ and 102-AZ would be partially concentrated and combined in a second aging waste tank. These combinations would save one tank over the Baseline Case used in Revision 20 of this document. These operations will also require acceptable heat calculations for the combined solids and will require higher than 5 M Na in the combined, concentrated supernates. A schedule and summary for in-tank washing activities is presented in Table 4 (MacLean, 1995).

Table 4. Summary of In-Tank Washing Activities

Date	In-Tank Washing Activity
Sept. 1995	Decant the NCAW supernate from Tank 101-AZ to Tank 101-AY.
Oct. 1996	Retrieve Tank 106-C solids into Tank 102-AY.
Jan. 1997	Decant Tank 102-AZ to AP Farm.
Apr. 1997	Transfer Tank 101-AZ sludge to Tank 102-AZ.
May 1997	Transfer Tank 106-C solids from Tank 102-AY to Tank 101-AZ for washing.
May 2001	Transfer leached 106-C solids to Tank 102-AZ.
June 2001	Transfer NCAW supernates to Tank 101-AZ.
Jan. 2004	Transfer Tank 101-AY and 102-AY non-aging sludges to Tank 102-AZ.

- One million gallons of aging tank space is kept available for receiving the contents of an aging waste tank, in the unlikely event of a tank leak (Department of Energy order 5820.2A).

- Tank 102-AY is designated as a 200 East Area dilute receiver for non-complexed wastes through FY 1996. This tank is currently receiving direct transfers of wastes from B Plant and rail or truck shipments via 204-AR vault from S Plant, T Plant, 100 Area, 300 Area, and 400 Area. This tank is scheduled to receive Tank 106-C solids in FY 1997.

Non-Aging Double-Shell Tanks

The remaining 24 DSTs are called non-aging waste tanks and are used to store wastes that do not contain high-heat loads in accordance with applicable operational and waste segregation policies. Non-aging waste tank operation assumptions are as follows:

- Approximately 50 Kgal of caustic will be added to Tank 107-AN in FY 1996 to mitigate the low caustic condition in the tank for all projection cases (Carothers, 1995).

- Operational tank usage for this projection are summarized in Table 5.

- Starting in FY 1999, 0.72 Mgal of operational space in the evaporator Feed and Receipt Tanks (Tanks 102-AW and 106-AW) was used as spare space (Awadalla, 1995) in all three projection cases.

- It was assumed that the TRU solids in Tank 102-SY would be retrieved to Tank 103-AW starting in December 1998 (Strode, 1995a). It was assumed that the NCRW solids from Tank 105-AW would be combined with the NCRW solids in Tank 103-AW starting in September 1999 (Strode, 1995a;

Awadalla, 1995). These assumptions were used in all three projection cases.

- o In the Alternate Acquisition Strategy Case, it was assumed that two tanks would be provided to the private vendors. These two tanks would contain waste upon turnover.

Table 5. Operational Tanks and Usage

Operation	Designated Tank
Evaporator Feed Tank	Tank 102-AW (modeled as a full tank)
Evaporator Receiver Tank	Tank 106-AW (tank level varies)
Dilute Receiver Tank	Tank 105-AW (PUREX direct transfers)
Dilute Receiver Tank	Tank 102-AY (1995-1996)
Dilute Receiver Tank	Tank 104-AW (1997-2015)
200 East SWL Receiver (DN)	Tank 101-AN
200 East SWL Receiver (DC)	Tank 101-AY (Tank 105-AP from 1996 on)
200 West SWL Receiver (DN)	Tank 102-SY
200 West SWL Receiver (DC)	Tank 102-SY
Spare Tank Space	Tank 103-AP (1995-1998)

- o Flushes are generated during the receipt of waste transfers either from railroad tank cars, tanker trucks, or after tank to tank transfers. Percent flushes are included with a description of each of the facility generations in Section 3.

Projected waste generations for Tank Farms were based on a combination of previously observed waste generation rates and anticipated operational needs that are explained below:

- o Tank Farm water additions to DSTS. Tank Farms waste generation rates and flushing activities generally increase with the restart of the 242-A Evaporator due to the need to transfer additional evaporator wastes, etc. The 242-A Evaporator was restarted in April 1994. During the period April 1994 through May 1995, the average monthly waste generation rate for Tank Farms was 10.92 Kgal/month. The target rate set for Tank Farms waste generations was 10 Kgal/month. All three projection cases estimated that Tank Farms would generate 10 Kgal/month or 120 Kgal/year to cover transfer line and air-lift circulator flushes. The WVR for evaporation of these flushes to DSSF was 99 (Sederburg, 1995).

- o Cross-site Transfers. All projection cases assumed that either the existing cross-site transfer line or the new cross-site transfer line (Project W-058, scheduled to be completed in 1998) would be available to allow cross-site transfer of SWL, facility generations, DST solids from

Tank 102-SY and/or SST solids. Without operable cross-site lines many of the TPA milestones involving West area wastes could not be achieved.

Previous projections have estimated that 50 Kgal of water (35 Kgal testing + 20 Kgal for transfer) would be needed for cross-site transfers. In this projection the water addition for cross-sites was reduced to 35 Kgal/transfer due to waste minimization actions defined for the FY 1995 transfer. During the period 1996-2000, approximately two cross-sites would be needed each year if non-complexed and complexed SWL were to be pumped through Tank 102-SY during the same year and current waste segregation practices were maintained. Based on the projected cross-site testing and transfers anticipated, 35 Kgal were allotted for FY 1995 and 70 Kgal/year was projected for the period FY 1996-1999. From 2000 on, the projected waste generation was reduced to 35 Kgal/year for cross-site transfers. All three projection cases used the same volumes for cross-site transfer line tests and flushes. The WVR for evaporation of these flushes to DSSF was 99 (Sederburg, 1995).

- Tank Fill Limits (except for special tank fill considerations):

  - AY, AZ Tanks: 980 Kgals
  - All other DSTs: 1140 Kgals

- The assumptions used to simulate tank transfers in this projection are listed below:

  - Tank 102-SY: 879 Kgal in the tank, and PRF not operating, pumped down to 50 Kgal above solids.
  - Tank 102-AY: Start transfer at 900 Kgal.
  - Tank 105-AW and other dilute receivers: Start transfer at 1000 Kgal, pump down to 50 Kgal above solids.

3.13 UO_3 Facility

The UO_3 Facility concentrated and calcined uranyl nitrate hexahydrate (UNH) recovered by the PUREX plant to produce uranium oxide (UO_3) and nitric acid (HNO_3). Until now, the UO_3 Facility has not produced any DST wastes. Rainwater collected at the facility will be sent to cribs.

3.14 Waste Sampling and Characterization Facility (WSCF)

The Waste Sampling and Characterization Facility (WSCF) was started in FY 1994. This projection assumed that WSCF would not send any wastes to DSTs (Hall, 1995).

3.15 100 Area

100-N Basin

The 100-N Basin was constructed in 1963 to receive irradiated fuel assemblies discharged from the N Reactor for the purpose of inspection, storage, and preparation for shipment. In 1988 the N Reactor was placed in a "cold standby" status (shutdown but capable of restarting). In 1989 all nuclear fuel was removed from N Basin and transferred to K Basin. In 1991 the Department of Energy-Richland (DOE-RL) directed Westinghouse to begin deactivation activities. A significant quantity of radioactively contaminated equipment, hardware, debris, and sediment have accumulated in 100-N Basin that will need to be removed. For the Baseline Case, it was assumed that N Basin water would be transferred to tank storage on project completion and that Emergency Dump Basin water would be pumped to the 109-N Cell sumps were it would passively evaporate over time and be released through the permitted elevated effluent release point (Greenidge, 1995). This scenario would result in the transfer of 1.4 Mgal of water to DSTs during FY 1996 (Greenidge, 1995). The same waste generation volume was used for all three cases.

100-K Basin

Initial disposal studies completed for 100-K Basin would not result in any pool water being sent to DSTs (Frederickson, 1995). This projection assumed that the cleanout of 100-K Basin would result in 14 Kgal of sludge (Alderman, 1995) being transferred to DSTs in FY 1999. Transfer of the sludge to DSTs would require approximately 530 Kgal of flush water. The above generations for 100-K Basin cleanout were used in the Baseline and Alternate Acquisition Strategy Cases. The Ecology Case assumed that cleanout of the 100-K Basin would result in a total of 6 Mgal of waste being sent to DSTs from FY 1997 to 2002. The 6 Mgal total included the 14 Kgal of sludge.

105-F & 105-H Basins

Plans to cleanout the 105-F and 105-H Basins are still being reviewed and the date of cleanout is uncertain due to funding. This projection assumed that the original volume of 250 Kgal (Griffin, 1991) would be received in FY 1999 (Koreski, 1995a). These assumptions for 105-F and 105-H Basin cleanout were used for all three projection cases.

The WVRF for evaporation of all 100 Area Basin wastes to DSSF is 99 (Sederburg, 1995). Flush volumes for 100 Area wastes is 44 per cent.

3.16 300 Area

Facilities in the 300 Area are used primarily for research and development activities or for analytical support. Some waste received in FY 1995 has been generated by decon of facilities. Liquid wastes from the various 300 Area Facilities are transferred to the 340 Facility. Liquid wastes collected at the 340 Facility are transferred to 204-AR vault in 20,000 gallon railroad tank cars. The Baseline Case projected 4.5 Kgal/month of miscellaneous waste would be generated from 300 Area facilities (Halgren, 1995b). All three projection cases used the same generation rates. Based on the chemical composition supplied for 300 Area waste streams (Halgren, 1995a), the WVRF for evaporation of 300 Area miscellaneous wastes to DSSF is 94 (Sederburg, 1995). Flush volume for 300 Area waste streams is 44 per cent.

3.17 400 Area

There are three major facilities in the 400 Area (Miller, 1995). These include the Fast Flux Test Facility (FFTF), the Maintenance and Storage Facility (MASF), and the Fuel and Material Examination Facility (FMEF). Radioactive liquid waste is primarily generated in conjunction with the removal of residual sodium from reactor components or with decontamination activities. Shutdown of the FFTF has increased the amount of liquid waste generated by the plant's Sodium Removal System. The Baseline Case projected

0.5 Kgal/month of miscellaneous waste would be generated from 400 Area facilities (Miller, 1995). All three projection cases used the same generation rates. The WVRF for evaporation of 400 Area miscellaneous wastes to DSSF is 94 (Sederburg, 1995). Flush volume for 300 Area waste streams is 44 per cent.

3.18 Low-Level Waste Pretreatment

- Construction of a new Low-Level Waste (LLW) Pretreatment Facility will begin in November 1998 and be completed in December 2003 to meet milestone M-50-02-T01. The Baseline and Ecology Cases assume that the facility will include additional evaporator capabilities to reduce the volume streams generated by the LLW pretreatment facility. The Alternate Acquisition Strategy Case assumes the private vendor will manage waste evaporation capability.

- Hot start-up of the LLW Pretreatment Facility to remove Cs and Sr from LLW will begin in FY 2005 and be completed by December 2028. The TWRS goal for completing LLW pretreatment is FY 2020. The initial LLW pretreatment feed will be double-shell slurry feed (DSSF) and SST saltcake. The pretreatment schedule (Wittman, 1995 and Orme, 1995a) for the "2C3-087" pretreatment/retrieval schedule used a ramped processing rate--3.43 Mgal in FY 2005; 6.87 Mgal in FY 2006; and 10.6 Mgal from FY 2007 on, as feed was available. The pretreatment work off rates assumed that SST solids could not be pretreated until the year after they were retrieved (Orme, 1995a). DST waste workoff was consistent with the TWRS process flowsheet input (Orme, 1995a and Wittman, 1995). All pretreatment volumes are shown in the spreadsheet for the Baseline Case (Section 5.1). The TWRS strategy for treatment and disposal of DST LLW mandates that all DSSF, DSS, and CP waste be retrieved for pretreatment by December 2007 (Honeyman, 1994).

- Retrieval of the sludge from each of the DSSF, DSS, and CP tanks will require approximately a 3:1 dilution. The diluent can be dilute waste already in the DST, existing dilute waste from another DST, recycled water, or fresh water (Honeyman, 1994).

- The Baseline and Ecology cases assumed that the LLW pretreatment and vitrification facilities would not be close coupled and lag storage would be required in the DST system to store pretreated streams. In addition to the pretreatment feed tank (filled), one "clean" LLW receipt tank and one HLW receipt tank will be required to store pretreated waste streams during the first year of operation (FY 2005). By the second year (FY 2006) of operation, an additional "clean" LLW receipt tank will be added (total of 4 operational tanks). It is assumed that these tanks will store all wastes from the LLW pretreatment facility destined for vitrification and that no additional DST storage will be required.

3.19 LLW Vitrification

- Construction of a LLW Vitrification Facility will begin in December 1997 and be completed in December 2003 (M-60-00-T1).

- Hot start-up of the LLW Vitrification Facility will begin in June 2005 (M-60-05) and vitrification of all LLWs will be completed by December 2028. Operation of the LLW Vitrification Facility will begin with pretreated DSSF and SST saltcake feeds.

- Feed characterization and frit acquisition would require one-half year prior to processing in the LLW Vitrification Facility.

- Vitrification rate will match the LLW Pretreatment rate.

- The Alternate Acquisition Strategy Case would startup in 2001 and extend thru 2004 and was assumed to continue pretreating waste thru 2009. In 2010 the vitrification capacity would increase to match the 19.5 Mgal/yr pretreatment rate assumed for Phase II.

3.20 High-Level Waste Pretreatment (Enhanced Sludge Washing)

- Construction of facilities for High-Level Waste (HLW) Pretreatment will begin in June 2001 (WDOE, 1994).

- Hot start-up of HLW Pretreatment will begin in June 2008 (M-50-04) and be completed by December 2028.

3.21 High-Level Waste Vitrification

- Construction of a new HLW Vitrification Facility will begin in June 2002 and be completed in December 2007 (M-51-03-T04).

- Hot start-up of the HLW Vitrification Facility will begin in December 2009 (M-51-03) and be completed by December 2028.

- This projection case allowed one-half year for feed characterization and determining glass formulation prior to processing in the HLW Vitrification Facility.

- Rated production of the HLW vitrification process was 20 metric tons/day for the Baseline and Ecology Cases. The Alternate Acquisition Strategy Case assumed a production rate of 22.5 metric tons/day (Voogd, 1995c).

3.22 Watch List/Safety

- The Baseline and Alternate Acquisition Strategy Cases assumed that agitation using a mixer pump would continue to be used for mitigation of the flammable gas buildup in Tanks 101-SY and 103-SY. It was assumed that these tanks would not require dilution until just prior to retrieval for pretreatment which was scheduled to start in 2005 (Orme, 1995a). Tanks 101-SY and 103-SY were diluted 1:1 and transferred to East Area during FY 2004-2006 to meet the pretreatment schedule.

- The Ecology Case used a 1:1 dilution of Tank 101-SY and 103-SY in FY 1998 and 2000, respectively, to mitigate the flammable gas buildup. Tanks 101-SY and 103-SY were left full with the extra dilute waste being transferred to East Area for storage.

3.23 Spare/Contingency Space

- A total of 2.28 million gallons (one aging and one non-aging tank) of spare space was reserved in case of a leak in an aging waste tank (DOE Order 5820.2A) for the Baseline and Alternate Acquisition Strategy Cases. The Ecology Case assumed that 2.12 million gallons of spare space would be reserved. From 1999 on, 0.72 Mgal of the operational space in Tanks 102-AW and 106-AW was designated as spare space (Awadalla, 1995) in all three projection cases.

- At the request of WHC and DOE management, one tank of contingency space has usually been set aside in the long range projection (1999 on) to account for possible inaccuracies in the WVP software when projecting waste generations and/or waste volume reduction factors. To minimize tank space needs, no contingency space is set aside in any of the three projection cases (Awadalla, 1995).

3.24 Waste Segregation

Waste segregation and compatibility are requirements of DOE Order 5820.2A (DOE, 1990) and WAC 173-303-395 (Dangerous Waste Regulations). The overriding purpose of waste segregation and compatibility are to ensure the safety of waste storage and tank farms operations; to minimize future pretreatment costs; and to comply with DOE Order 5820.2A and WAC 173-303-393. Wastes that are typically segregated include:

- Phosphate Wastes--dilute phosphate (DP) or concentrated phosphate (CP).
- Wastes Containing High Organic Concentrations--dilute complexed (DC) or complexant concentrate (CC).
- TRU containing wastes--Neutralized Cladding Removal Wastes (NCRW solids) or PFP solids (PT).
- Watch list tank wastes to prevent inadvertent commingling with other wastes.
- Pretreated waste streams.
- Washed NCAW solids, etc.
- Concentrated interim waste types--e.g., double-shell slurry feed (DSSF) or double-shell slurry (DSS) need to be separated from dilute wastes to prevent the need to reconcentrate.
- Wastes exhibiting exothermic reactions.

All three projections assume that current waste segregation practices are observed. Waste segregation practices are summarized in Table 6 (Fowler, 1995).

Table 6. Waste Compatibility Matrix

Source Waste Type	Receiver Waste Type: DN	DSSF	DC	CC	(PD) NCRW	PT	NCAW	CP
DN	X	X	X	X	X	X	X	X
DSSF	X	X						
DC			X	X*				
CC			X*	X				
(PD) NCRW SOLIDS	X				X	X		
(PT) PFP SOLIDS	X				X	X		
NCAW							X	
CP								X

(*) Adding CC to DC is permitted but would not ordinarily be done. The volume of combined waste which would need to be evaporated would be increased, resulting in increased evaporation costs.

3.25 Loss of DST Space

These projection case assumed that none of the DSTs would be removed from service by 2015.

3.26 New DST Construction

TPA Milestone M-42-01 called for the construction of two new tanks in 200 West Area by February 1998 with up to four additional tanks being constructed in 200 East Area (M-42-01) by December 1998. However, this projection case assumed that no new DSTs would be constructed by 2015.

3.27 DST Tank Solids Levels

Solids levels in the DSTs are shown in Table 7 (Hanlon, 1995 and Koreski, 1995). Solids levels have been estimated for the tanks marked with an asterisk (*) based on the previous solids level measurement and the percent solids in facility generations that have been added to the tank since the last solids level measurement. Tanks with little or no solids are not listed.

Table 7. DST Solids Levels (Kgal)

TANK	SOLIDS	TANK	SOLIDS	TANK	SOLIDS
102-AN	89	101-AW	84	101-AY	83
104-AN	264	102-AW	55	102-AY	32
106-AN	17	103-AW*	487	101-SY	560
107-AN	134	104-AW*	267	102-SY*	133
101-AZ	35	105-AW	300	103-SY	4
102-AZ	95	106-AW*	217		

3.28 Assumption Summary

Assumptions used for all cases are presented in Table 8.

Table 8. Assumption Matrix
For the June, 1995 Operational Waste Volume Projection
(All Years are Fiscal Years)

	TPA Baseline Case	WA DOE Case	Alternate Acquisition Strategy Case
Meets TPA Milestones	Yes	Yes	Yes
Facility Generations			
Total Limit, Kgal/mo	21.8-37.5	21.8-37.5	21.8-37.5
PUREX			
Monthly Rate, Kgal/mo	0	0	0
TCO Scheduled	1995-1996	1995-1996	1995-1996
TCO Volume, Kgal	606 DN	606 DN	606 DN
Flush for TCO	10%	10%	10%
WVRF for TCO (to DSSF)	99	99	99
UO_3 Facility			
Monthly Rate, Kgal/mo	0	0	0
B Plant			
Monthly Rate, Kgal/mo	5 (1995-2001)	5 (1995-2001)	5 (1995-2001)
Monthly Rate, Kgal/mo	0.5(2002-2028)	0.5(2002-2028)	0.5(2002-2028)
Flush for misc. waste	0%	0%	0%
WVRF, misc. waste(to DSSF)	99	99	99
TCO Scheduled	1997-2001	1997-2001	1997-2001
TCO Volume, Kgal DN	450	450	450
Flush for TCO	10%	10%	10%
WVRF for TCO (to DSSF)	99	99	99
S Plant			
Monthly Rate, Kgal/mo	1.7 to 2.5	1.7 to 2.5	1.7 to 2.5
Flush for misc. waste	22%	22%	22%
WVRF, misc. waste(to DSSF)	99	99	99
T Plant			
Monthly Rate, Kgal/mo	0.13 to 15	0.13 to 15	0.13 to 15
Flush for misc. waste	22%	22%	22%
WVRF, misc. waste(to DSSF)	99	99	99
300 Area			
Monthly Rate, Kgal/mo	4.5	4.5	4.5
Flush for misc. waste	44%	44%	44%
WVRF, misc. waste(to DSSF)	94	94	94
400 Area			
Monthly Rate, Kgal/mo	0.5	0.5	0.5
Flush for misc. waste	44%	44%	44%
WVRF, misc. waste(to DSSF)	94	94	94
WSCF			
Monthly Rate, Kgal/mo	0.0	0.0	0.0
Tank Farms			
Monthly Rate, Kgal/mo	10	10	10
WVRF, flushes (to DSSF)	99	99	99

Table 8. Assumption Matrix
For the June, 1995 Operational Waste Volume Projection
(continued)

	TPA Baseline Case	WA DOE Case	Alternate Acquisition Strategy Case
100 Area			
Monthly Rate, Kgal/mo	0	0	0
100-N			
TCO Scheduled	1996	1996	1996
TCO Volume, Kgal	1500 DN	1500 DN	1500 DN
100-K Basin Cleanout			
TCO Scheduled	1998	1997-2002	1998
TCO Volume, Kgal	530	6000	530
105-F & 105-H Basin			
Total in 1999, Kgal	250	250	250
Flush, ALL 100 Area Waste	44%	44%	44%
WVRF, ALL TCO waste(to DSSF)	99	99	99
Solid Waste Mixed Waste Trench 31 Leachate			
Monthly Rate, Kgal/mo	0	0	0
WVRF (to DSSF)	99	99	99
Tank 107-AN Caustic Addition			
Addition in 1995 (Kgal)	50	50	50
Salt Well Liquid Pumping			
Volume remaining (Mgal)	6.0	6.0	6.0
West Area Receiver	Tank 102-SY	Tank 102-SY	Tank 102-SY
Start Complexed SWL (200W)	1996	1996	1996
Completion, FY	2000	2000	2000
Dilute Complexed SWL (Mgal)	2.5	2.5	2.5
Porosity (apparent)	61%	61%	61%
Flush for SWL Pumping	25%	25%	25%
WVRF, non-complexed (to DSSF)	47	47	47
WVRF, complexed (to DSSF)	10	10	10
Single-Shell Tank (SST) Solids			
Tank 106-C Retrieval	1997	1997	1997
SST Waste Retrieval Demo	2003	2003	2003
Tank Farm Closure start	2018	2018	2018
Approximate Dilution Ratio	3:1	3:1	3:1
Vol. with Diln., 2004(Mgal)	0.8	0.8	0.8
Vol. with Diln., 2005(Mgal)	1.2	1.2	1.2
Meets TPA Milestones	Yes	Yes	Yes
No. SSTs Retrieved	149	149	149
Sludge Retrieved (Mgal)	12.2	12.2	12.2
Saltcake Retrieved (Mgal)	23.4	23.4	23.4

Table 8. Assumption Matrix
For the June, 1995 Operational Waste Volume Projection
(continued)

	TPA Baseline Case	WA DOE Case	Alternate Acquisition Strategy Case
Low Level Waste (LLW) Pretreatment Facility			
(Alternate Acquisition Strategy assumptions at end of Table)			
Includes New Evaporator	Yes	Yes	Vendor's Option
Start Construction(mo/yr)	11/1998	11/1998	11/1998(Phase I)
Constr. complete(mo/yr)	12/2003	12/2003	04/2000(Phase I)
Hot Start	12/2004	12/2004	10/2000(Phase I)
Complete processing(mo/yr)	12/2028	12/2028	12/2009(Phase I)
TWRS completion date	2020	2020	N/A
Starting Feed	DSSF/SST Saltcake	DSSF/SST Saltcake	DSSF
Characterization time per tank	0.5 year	0.5 year	0.5 year
Volume Pretreated, Mgal			
Yr 1	3.43 (FY 2005)	3.43 (FY 2005)	3.1 (FY 2001)
Yr 2	6.87 (FY 2006)	6.87 (FY 2006)	3.1 (FY 2002)
Yr 3	10.6 (FY 2007)	10.6 (FY 2007)	3.1 (FY 2003)
Yr 10	10.6 (FY 2014)	10.6 (FY 2014)	19.5 (12/2009-12/2018)
LLW Feed Tank	1(full)	1(full)	2(full)
LLW Receipt Tanks; 2005	1	1	0
LLW Receipt Tanks; 2006 on	2	2	0
HLW Receipt Tanks; 2005 on	1	1	1
LLW Vitrification Facility (Alternate Acquisition Strategy Assumptions at end of Table)			
Start Construction(mo/yr)	12/1997	12/1997	11/1998(Phase I)
Constr. complete(mo/yr)	12/2003	12/2003	04/2000(Phase I)
Hot Start	06/2005	06/2005	10/2000(Phase I)
Complete vitrification	12/2028	12/2028	12/2009(Phase I)
Rate match LLW Pretreatment processing rate	Yes	Yes	Yes
In-Tank Washing			
Start	09/1995	09/1995	09/1995
Basic description of solids comb-ination.	Combine washed 101-AZ, 102-AZ, & 106-C solids.	Combine washed 101-AZ, 102-AZ, & 106-C solids.	Combine washed 101-AZ, 102-AZ, & 106-C solids.
High Level Waste (HLW) Pretreatment (Enhanced Sludge Washing)			
(See Alternate Acquisition Strategy Assumption near end of Table)			
Start Construction(mo/yr)	06/2001	06/2001	01/2005
Hot Start(enh. sludge wash)	06/2008	06/2008	01/2011
Complete processing	12/2028	12/2028	12/2028
HLW Vitrification Facility			
(See Alternate Acquisition Strategy Assumption near end of Table)			
Start Construction(mo/yr)	06/2002	06/2002	01/2005
Constr. complete(mo/yr)	12/2007	12/2007	01/2011
Hot Start	12/2009	12/2009	12/2011
Complete vitrification	12/2028	12/2028	12/2028
Characterization time per tank	1.5 years	1.5 years	1.5 years
Production rate (metric ton/day)	20	20	22.5

Table 8. Assumption Matrix
For the June, 1995 Operational Waste Volume Projection
(continued)

	TPA Baseline Case	WA DOE Case	Alternate Acquisition Strategy Case
PFP Stabilization			
Start	1995-2006	1995-2006	1995-2006
Volume, Kgal	70	70	70
Flush	22%	22%	22%
WVRF	81	81	81
Evaporator			
Next Outage Date	None	None	None
Evaporation Product	dDSSF	dDSSF	dDSSF
Evaporation Limit (g/ml)	1.41	1.41	1.41
LERF capacity (Mgal)	13	13	13
Gal. condensate/gal. WVR	<1.3	<1.3	<1.3
Yearly evaporation of DN (i.e., maintain currency)	Yes	Yes	Yes
Liquid Effluent Treatment Facility			
Start date (mo/yr)	11/1995	11/1995	11/1995
Rate	150 gpm	150 gpm	150 gpm
TOE	70%	70%	70%
Watch List/Safety			
101-SY Dilution & date	None	1:1 (1998)	None
103-SY Dilution & date	None	1:1 (2000)	None
Require cross-site transfer	No	Yes	No
Spare/Contingency Space			
Spare Space, Mgal	2.28	2.12	2.28
Use 0.72 Mgal of Operational space in 106-AW as part of spare space from 1999 on	Yes	Yes	Yes
Contingency space, Mgal	None	None	None
-date	N/A	N/A	N/A
Waste Segregation			
Store DSSF on NCRW solids	No	No	No
Segregate Complexed wastes	Yes	Yes	Yes
Loss of DST Space			
Number Tanks Removed from Service	None	None	None
Date Tank Removed	N/A	N/A	N/A
New DST Construction			
New West Area Tanks	None	None	None
Date Constructed	N/A	N/A	N/A
New East Area Tanks	None	None	None
Date Constructed	N/A	N/A	N/A

Table 8. Assumption Matrix
For the June, 1995 Operational Waste Volume Projection
(continued)

	TPA Baseline Case	WA DOE Case	Alternate Acquisition Strategy Case
New Cross-Site Transfer Line			
Start Construction (TPA)	11/1995	11/1995	11/1995
Operational (TPA)	02/1998	02/1998	02/1998
Old line operational	Yes	Yes	Yes
DST Retrieval			
102-SY solids retrieved to 200 East Area	12/1998	12/1998	12/1998
Consolidation of NCRW solids in 103-AW & 105-AW	Yes (09/1999)	Yes (09/1999)	Yes (09/1999)
Waste Privatization Case	No	No	Yes
Dilute/Pretreat/Vitrify DSSF from Tank 101-AW	N/A	N/A	2001
Dilute/Pretreat/Vitrify NCAW supernates from Tank 101-AY	N/A	N/A	2002
Retrieve/Pretreat/Vitrify NCAW solids from Tank 102-AZ	N/A	N/A	2002
Pretreat/Vitrify 360 Kgal CC waste from Tank 102-AN	N/A	N/A	2003
Pretreat/Vitr NCRW & PFP solids from Tank 103-AW	N/A	N/A	2004

4.0 ECOLOGY AND ALTERNATE ACQUISITION STRATEGY ASSUMPTIONS

The Baseline Case is meant to project DST needs based on TPA milestones, TWRS program planning, and the most realistic operational assumptions. The Baseline Case presents a basis for evaluating future DST space needs through the end of FY 2015. This report presents a projected range of tank needs which is used to generate recommendations regarding site activities, waste management activities, facility requirements, and the need to build additional double-shell tanks. This document presents the results of three projections cases--Baseline, Ecology, and the Alternate Acquisition Strategy Cases. Operating assumptions for the three cases were established in June 1995. The following section will describe assumptions specific to the Ecology and Alternate Acquisition Strategy Cases. These assumptions are summarized in Table 8.

4.1 Ecology Case Assumptions

Assumptions for the Ecology Case are the same as those for the Baseline Case except for the following:

- Spare Space. Spare space was reduced from 2.28 million gallons to 2.12 million gallons.

- 100 K Basin Cleanout Volume. Plans to cleanout the 100-K Basin are still being reviewed. The Baseline Case assumed that a total of 544 Kgal of waste would be sent to DSTs (14 Kgal of sludge plus 530 Kgal of flush water). The Ecology Case assumed that more wastes would be sent to DSTs from 100-K Basin Cleanout. The amount of waste sent to DSTs was increased to 6 million gallons from FY 1997 to 2002. The 6 million gallons included the 14 Kgal of sludge. The WVRF for evaporation of the 100-K Basin wastes to DSSF is 99 (Sederburg, 1995). Flush volumes for 100 Area wastes is 44 per cent.

- Watch List/Safety. The Baseline Cases assume that agitation using a mixer pump would continue to be used for mitigation of the flammable gas buildup in Tanks 101-SY and 103-SY. The Ecology Case assumed that a 1:1 dilution of Tank 101-SY and 103-SY in FY 1998 and 2000, respectively, would be used to mitigate the flammable gas buildup. Tanks 101-SY and 103-SY were left full with the extra dilute waste being transferred to East Area for storage. By the year 2006 both the Baseline Case and the Ecology Case had pretreated the wastes from Tanks 101-SY and 103-SY.

4.2 Alternate Acquisition Strategy Case Assumptions

The term "Alternate Acquisition Strategy" here refers to the concept of bringing in outside vendors to build and operate pretreatment and vitrification facilities to dispose of Hanford wastes. At the time this projection was completed, the Alternate Acquisition Strategy assumptions had not been finalized and the assumptions used in this projection are subject to change. The goal of Phase I is to procure services from two private contractors to pretreat and solidify some or all of the wastes contained in six of the DSTs to prove the Alternate Acquisition Strategy concept (Voogd, 1995a). The primary assumption changes for the Alternate Acquisition Strategy Case would be in retrieval, pretreatment, and vitrification assumptions.

Assumptions for the Alternate Acquisition Strategy Case are the same as those for the Baseline Case except for the following (Voogd, 1995b and 1995c):

- Feed Tanks. It was assumed that Tanks 102-AP and 104-AP were to be used as Alternate Acquisition Strategy feed tanks.
- Evaporator. Vendor's option to provide waste evaporation.
- Pretreatment Rate. The pretreatment rate during Phase I was 3.1 Mgal/year. Although the pretreatment rate was assumed to be 3.1 Mgal/yr, only one tank of waste was pretreated in 2001.
- Pretreatment Schedule for Phase I. The pretreatment waste and volume schedule for Phase I are shown in Table 9. From 2005 through 2009, it was assumed that additional DSSF, CC, and SST solids waste would be pretreated and vitrified at a rate of 3.1 Mgal/yr. The schedule of tanks to be pretreated was developed based on TWRS pretreatment and process flowsheet input (Orme, 1995a and Orme, 1995b).
- SST Solids Retrieval. The SST solids retrieval rate from 2006 on would have to be reduced from the rate used in the Baseline and Ecology Cases to avoid exceeding available space.

Table 9. Alternate Acquisition Strategy Pretreatment Schedule for Phase I

Fiscal Year	Waste Type	Volume Pretreated (Kgal)	Tank	Comments
2001	DSSF	1123	101-AW	Tank is currently concentrated to ~10 M Na and would be diluted in feed tanks.
2002	NCAW supernate	980	101-AZ (101-AZ & 102-AZ)	In-tank washing will transfer and concentrate the 1751 Kgal of supernate from NCAW Tanks 101-AZ and 102-AZ.
2002	NCAW solids	130	102-AZ (101-AZ & 102-AZ)	In-tank washing will wash, transfer, and combine the solids from Tank 101-AZ with washed solids from Tank 102-AZ.
2003	CC	360	102-AN	Only pretreats a portion of the wastes in Tank 102-AN.
2004	NCRW solids	920		It is assumed that the PFP solids from Tank 102-SY and the NCRW solids from Tanks 103-AW and 105-AW will be combined into Tank 103-AW by the end of FY 1999.
2005-2009	DSSF,CC, & SST solids	3.1 Mgal/yr	Several	Phase I Pretreatment rate.
2010+	Primarily SST solids	~19.5 Mgal/yr	Several	Phase II Pretreatment rate.

5.0 RESULTS AND CONCLUSIONS

The results of a waste volume projection can be used to forecast tank space needs versus time, forecast evaporator operation, LLW pretreatment and disposal, HLW pretreatment and disposal, analyze tank space issues for aging and non-aging waste tanks, tank usage, or to determine the need and schedule for retrievals or cross-site transfers. To predict tank space needs, a graphic is produced showing tank count versus time as compared to the available space. A short range waste volume projection predicts tank space needs over approximately a four year period in monthly intervals. A long range waste volume projection predicts tank space needs over a longer range (1994-2015) in yearly intervals.

Except for near term scheduled evaporator operations, both types of projections assume that dilute waste will be evaporated to DSSF in the year they are produced, provided an evaporator is operational and the WVR limit of the evaporator has not been exceeded. In later parts of the projections when tank space becomes tight due to pretreatment needs and/or the amount of SST solids being retrieved, the evaporator is assumed to operate yearly even if volumes are small to minimize waste storage needs. Long range projection graphics for the Baseline Case, Ecology Case, and Alternate Acquisition Strategy Case are presented in Sections 5.1, 5.2, and 5.3, respectively. Short range graphics, tank usage graphics, evaporator WVR data, and a spreadsheet showing inputs/outputs have been included for the Baseline Case only. Results of the projection cases are included in the following sections.

5.1 Baseline Case Results and Conclusions

Assumptions for the Baseline Case represent the current planning basis for TWRS programs to meet TPA Fourth Amendment milestones. The Baseline Case is meant to project DST needs based on TPA milestones and TWRS program planning. Projected tank space needs for the Baseline Case are shown in Figure 3. The Baseline Case manages projected tank space needs within the available tank space (28 DSTs) by incorporating several space saving assumption changes that were not included in the previous document. These space saving alternatives eliminate the need to build additional DSTS but add additional risks to the TWRS program. These actions and some of the risks are listed below:

- Waste generation rates and TCO volumes have been reduced compared to previous projections.

- It was assumed that agitation using a mixer pump would continue to be used for mitigation of the flammable gas buildup in Tanks 101-SY. It was assumed that neither Tank 101-SY or 103-SY would require dilution until just prior to retrieval for pretreatment which was scheduled to start in 2005 (Orme, 1995a). If a 1:1 dilution is required at a future date the increase in tank space to dilute Tanks 101-SY and 103-SY would be approximately 1.9 million gallons.

- In tank washing was used to consolidate all NCAW and 106-C solids in one aging waste tank; all NCAW supernates were concentrated and stored in a second aging waste tank (MacLean, 1995). These combinations free up one additional aging waste tank from June 2001 on. Consolidation of all NCAW solids in one tank may not be achievable if the combined solids level/heat load exceed OSR limits. Likewise, combination of all NCAW supernates into one tank may not be achievable since the supernates would have to be concentrated to greater than 5 M Na. The volume impact from this risk is dependent on the magnitude of the changes in assumptions but could be up to one million gallons (one tank).

- Consolidation of all NCRW and PFP solids into one DST (approximately 930 Kgal of solids) (Awadalla, 1995). The large amount of solids may make retrieval for disposal difficult or impossible which could add an additional tank.

- Operational space in Tanks 102-AW and 106-AW was used to provide 0.72 Mgal of the required 2.28 Mgal of spare space from 1999 on (Awadalla, 1995). This assumption change reduces operational space which may create operational/space problems during the period when SST solids are being retrieved.

- Tank 102-SY was used to pump complexed SWL in West area starting in FY 1996 in order to meet intermediate TPA milestones for SWL pumping. Retrieval of the TRU solids in this tank is not scheduled until 12/1998. Segregation issues involving contacting complexed SWL with the TRU heel in Tank 102-SY may make this assumption impossible which could delay SWL pumping TPA milestones.

- Single-shell tank sludge is scheduled for retrieval starting in FY 2004. To minimize storage space, it was assumed that up to 900 kgal of sludge could be stored in a 1140 kgal DST. The large amount of solids may make retrieval for disposal difficult or impossible.

- At the request of DOE and WHC management, previous OWVPs had included one tank of contingency space in the long range portion (FY 1999 on) to account for any inaccuracies in waste generation rates or waste volume reduction factors. This contingency space has been removed (Awadalla, 1995).

- This projection assumed that dilute non-complexed waste could be evaporated to a specific gravity (SpG) of 1.41. Limiting the evaporation of waste to a SpG of 1.41 has been proposed as an acceptable threshold for preventing the accumulation of flammable gas in DSTs (Fowler, 1995b). The special projection L9503A which was completed in April 1995 (Awadalla, 1995) reduced waste to a SpG of 1.35. The higher specific gravity limit allows waste to be evaporated further, saving approximately 2/3 of a tank by the end of the projection.

- Some double-shell tanks are nearing their design life. This projection does not provide for the loss of any DST space through 2005. The volume of this impact would be approximately one million gallons if one DST is lost.

The space saving actions listed above eliminate the need for construction of new DST space that was recommended based on the previous projection (Rev. 20) but introduce additional uncertainties and risks into the overall TWRS program. If many of these items are not possible or if waste generations exceed those used in this projection, it may be necessary to either delay site cleanup activities, delay TPA milestones (e.g., SWL pumping and/or SST solids retrieval), or build additional tank space in order to avoid exceeding the available DST space. Additional studies are currently in progress to address and solve the issues that have identified.

A spreadsheet summarizing the waste generations, evaporator WVR, and pretreatment requirements has been added to this document and is included as Table 10. This spreadsheet is included to present a global view of how the various inputs and outputs affect tank space. It is not intended to be used to project double-shell tank needs for other projection cases.

Figure 4 shows the waste additions and available space in a bar graph format to allow the user to more easily visualize the tank space usage. Numbered comments have been added to the bar graph explaining the inventory changes. These comments follow the figure.

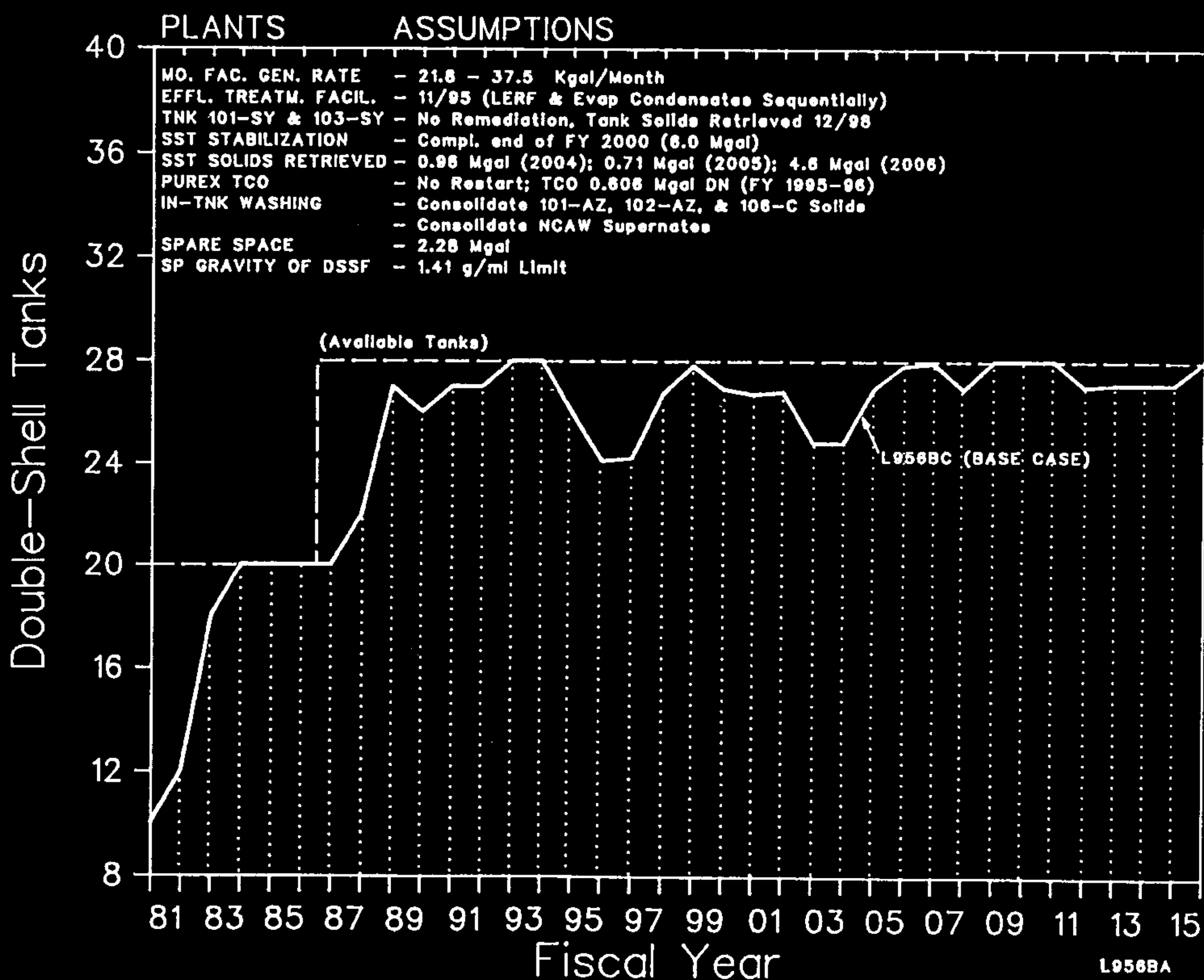


Figure 3. Double-Shell Tank Requirements for the Baseline Case

Table 10. Spreadsheet of Waste Additions and Reductions for Baseline Case

FISCAL YEAR --->	9/30/93	9/30/94	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
BASELINE SPACE UTIL												
STARTING INVENTORY	25507	22992	22992	19261	21113	19943	20960	21735	21142	20916	20774	20817
SPARE SPACE	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280
CONTINGENCY SPACE		0	0	0	0	0	0	0	0	0	0	0
WATCH LIST TANK SPACE AVAIL	673	726	726	726	726	726	726	726	726	726	726	726
SEGREGATED SPACE AVAIL	1038	605	2975	3277	2699	3640	2713	2243	3433	1315	1315	1200
PRIORITY/OPERATIONAL AVAIL	1174	1641	1668	1172	1984	1605	2893	3099	2098	2067	1969	2087
MISC HEADSPACE AVAIL	154	66										
NEW WASTE ADDITIONS												
PUREX MISC			0	0	0	0	0	0	0	0	0	0
UO3			0	0	0	0	0	0	0	0	0	0
B PLANT			60	60	60	60	60	60	60	5	5	5
S PLANT			20	25	30	30	30	30	30	30	30	30
T PLANT			28	37	47	49	68	89	112	135	180	180
300 AREA			54	54	54	54	54	54	54	54	54	54
400 AREA			6	6	6	6	6	6	6	6	6	6
WSCF			0	0	0	0	0	0	0	0	0	0
TANK FARM (LINE, ALC)			120	120	120	120	120	120	120	120	120	120
EVAPORATOR FLUSHES			85	100	100	100	100	65	85	85	85	85
PFP LAB W/ SOLIDS			6	6	7	7	7	7	6	6	6	6
TK 101-SY DILN/RETRVAL			0	0	0	0	0	0	0	0	0	0
TK 103-SY DILN/RETRVAL			0	0	0	0	0	0	0	0	0	748
TK 102-SY SOLIDS RETRVAL			0	0	0	0	400	0	0	0	0	0
TK 106-C SOLIDS RETRVAL			0	0	800	0	0	0	0	0	0	0
TK 105-AW SOLIDS RETRVAL			0	0	0	0	1164	0	0	0	0	0
PUREX TCO (94-97) W/ FLUSH			460.9	226.8	0	0	0	0	0	0	0	0
B PLANT TCO (97-2001) W/ FLUSH			0	0	99	99	99	99	99	0	0	0
100N TCO (95-99) W/ FLUSH			0	2162	0	0	0	0	0	0	0	0
PFP STABILIZATION			0	0	0	0	0	0	0	0	0	0
SWL PUMPING W/O FLUSH			206	1164	2355	1541	680	56	0	0	0	0
IN-TANK WASHING OF 101-AZ			0	0	100	0	0	0	0	0	0	0
SST SOLIDS RETRVAL			0	0	0	0	0	0	0	0	0	980
100 K F&H + FLUSH			0	0	0	763.2	380	0	0	0	0	0
107-AN CAUSTIC			50	0	0	0	0	0	0	0	0	0
FAC GEN +SWL+x-site FLUSHES			123	401	702	498	287	101	92	97	107	107
Cs STREAM FROM PRETREATMENT												
TRANSFER SST SLUDGE TO VITRIFI												
DILN OF DST WASTE TO 7M Na												
NEW WASTE ADDITIONS TOTAL			1218.9	4361.8	4480	3327.2	3435	707	664	538	593	2301
TOTAL WASTE BEFORE EVAP		22992	24211	23623	25593	23270	24395	22442	21806	21454	21367	23118
YEARLY CALC WVR FROM ABOVE												
CUM CALC WVR FROM ABOVE												
*** ACTUAL EVAP WVR ********			-4950	-2510	-5650	-2310	-2660	-1300	-890	-680	-550	-550
*** CUM ACTUAL EVAP WVR ***			-4950	-7460	-13110	-15420	-18080	-19380	-20270	-20950	-21500	-22050
PRETREATMENT LOSS*			0	0	0	0	0	0	0	0	0	0
VITRIFICATION LOSS*												
NET INVENTORY CHANGE			-3731.1	1851.8	-1170	1017.2	775	-593	-226	-142	43	1751
END OF YEAR INVENTORY	25507	22992	19261	21113	19943	20960	21735	21142	20916	20774	20817	22568
TOTAL CAPACITY	31280	26310	26910	28558	27632	29211	30347	29490	29453	27162	27107	28861
	28.0	25.4	24.2	25.6	24.8	26.2	27.2	25.4	26.4	24.4	24.3	25.9
	9/30/93	9/30/94	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
		(-2427) EVAP WVR										

FISCAL YEAR --->	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
BASELINE SPACE UTIL											
STARTING INVENTORY	22568	21190	21575	20609	21913	25330	20485	18064	20969	21484	23056
SPARE SPACE	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280
CONTINGENCY SPACE	0	0	0	0	0	0	0	0	0	0	0
WATCH LIST TANK SPACE AVAIL	726	726	726	726	726	726	726	726	726	726	726
SEGREGATED SPACE AVAIL	3162	4098	4634	3315	1770	4357	5885	2991	2271	2443	1627
PRIORITY/OPERATIONAL AVAIL	3151	2895	2883	3553	1473	3007	2915	3457	3355	2521	2279
MISC HEADSPACE AVAIL											
NEW WASTE ADDITIONS											
PUREX MISC	0	0	0	0	0	0	0	0	0	0	0
UO3	0	0	0	0	0	0	0	0	0	0	0
B PLANT	5	5	5	5	5	5	5	5	5	5	5
S PLANT	30	30	30	30	30	30	30	30	30	30	30
T PLANT	180	180	180	180	180	180	180	180	180	180	180
300 AREA	54	54	54	54	54	54	54	54	54	54	54
400 AREA	6	6	6	6	6	6	6	6	6	6	6
WSCF	0	0	0	0	0	0	0	0	0	0	0
TANK FARM (LINE, ALC)	120	120	120	120	120	120	120	120	120	120	120
EVAPORATOR FLUSHES	85	85	85	85	85	85	85	85	85	85	85
PFP LAB W/ SOLIDS	6	6	6	6	6	6	6	6	6	6	6
TK 101-SY DILN/RETRVAL	1057	0	0	0	0	0	0	0	0	0	0
TK 103-SY DILN/RETRVAL	0	0	0	0	0	0	0	0	0	0	0
TK 102-SY SOLIDS RETRVAL	0	0	0	0	0	0	0	0	0	0	0
TK 106-C SOLIDS RETRVAL	0	0	0	0	0	0	0	0	0	0	0
TK 105-AW SOLIDS RETRVAL	0	0	0	0	0	0	0	0	0	0	0
PUREX TCO (94-97) W/ FLUSH	0	0	0	0	0	0	0	0	0	0	0
B PLANT TCO (97-2001) W/ FLUSH	0	0	0	0	0	0	0	0	0	0	0
100N TCO (95-99) W/ FLUSH	0	0	0	0	0	0	0	0	0	0	0
PFP STABILIZATION	0	0	0	0	0	0	0	0	0	0	0
SWL PUMPING W/O FLUSH	0	0	0	0	0	0	0	0	0	0	0
IN-TANK WASHING OF 101-AZ	0	0	0	0	0	0	0	0	0	0	0
SST SOLIDS RETRVAL	712	4804	6744	11290	13564	6044	8468	11320	11444	12296	11492
100 K F&H + FLUSH	0	0	0	0	0	0	0	0	0	0	0
107-AN CAUSTIC	0	0	0	0	0	0	0	0	0	0	0
FAC GEN +SWL+x-site FLUSHES	107	107	107	107	107	107	107	107	107	107	107
Cs STREAM FROM PRETREATMENT	200	200	200	200	200	200	200	200	200	200	200
TRANSFER SST SLUDGE TO VITRIFI								2514		205	1190
DILN OF DST WASTE TO 7M Na	0	2398	2537	171							
NEW WASTE ADDITIONS TOTAL	2602	7795	10074	12254	14357	6837	9261	14627	12237	13294	13475
TOTAL WASTE BEFORE EVAP	25170	28985	31649	32863	36270	32167	29746	32691	33206	34778	36531
YEARLY CALC WVR FROM ABOVE											
CUM CALC WVR FROM ABOVE											
*** ACTUAL EVAP WVR ********	-550	-540	-440	-350	-340	-340	-340	-380	-380	-380	-620
*** CUM ACTUAL EVAP WVR ***	-22600	-23140	-23580	-23930	-24270	-24610	-24950	-25330	-25710	-26090	-26710
PRETREATMENT LOSS*	-3430	-6670	-10600	-10600	-10600	-10600	-10600	-10600	-10600	-10600	-10600
VITRIFICATION LOSS*						-742	-742	-742	-742	-742	-742
NET INVENTORY CHANGE	-1378	385	-966	1304	3417	-4845	-2421	2905	515	1572	1513
END OF YEAR INVENTORY	21190	21575	20609	21913	25330	20485	18064	20969	21484	23056	24569
TOTAL CAPACITY	30508	31574	31132	31787	31579	30895	29870	30423	30116	31026	31481
	27.3	28.3	27.9	28.4	28.3	27.7	26.8	27.2	27.0	27.8	28.2
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015

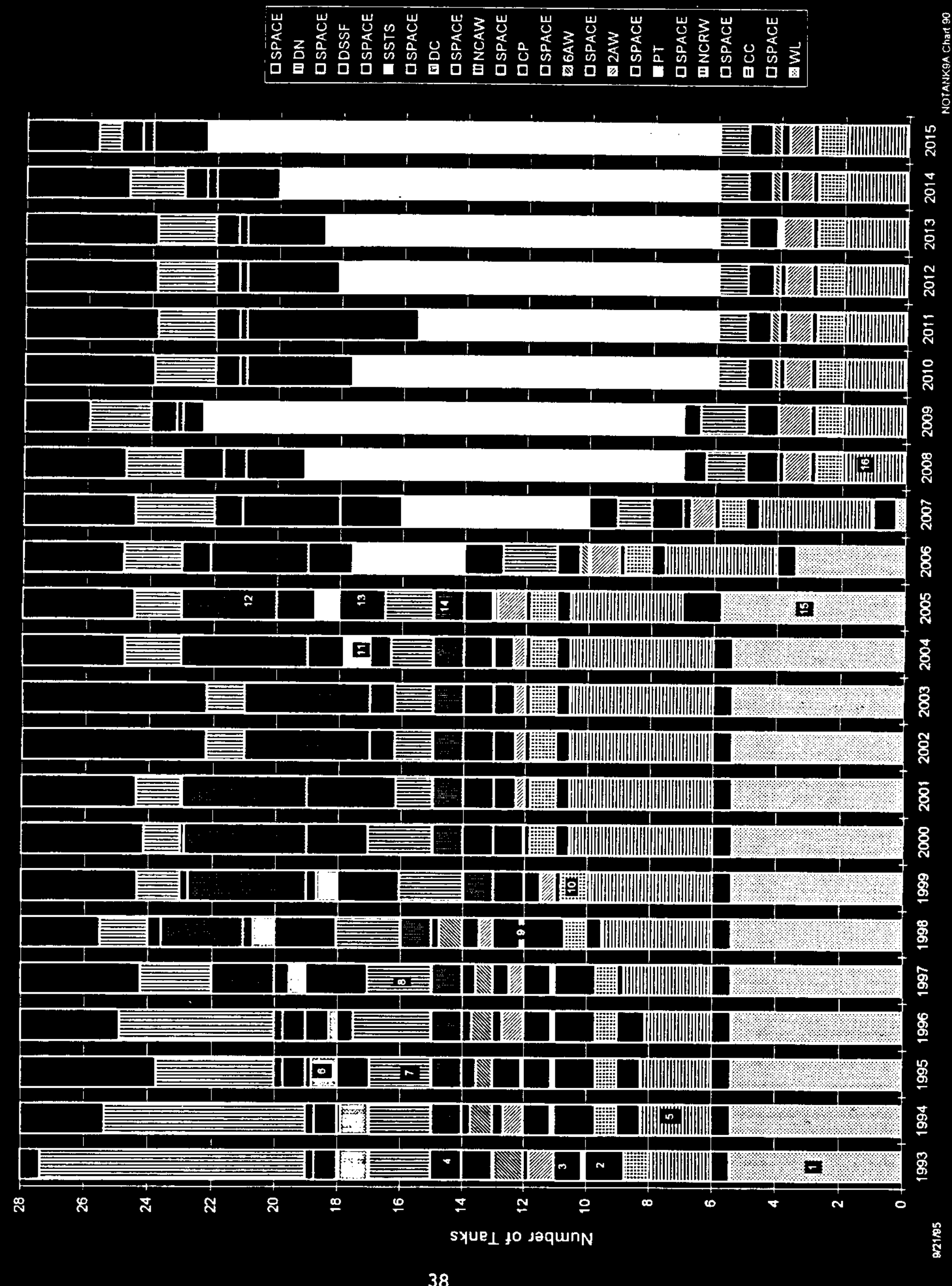


Figure 4. Double-Shell Tank Inventory and Space for the Baseline Case

Comments for Figure 4--Double-Shell Tank Inventory and Space for the Baseline Case

This bar chart graphic is meant to show the increase and decrease in the various waste categories or waste types for the Baseline Projection L956BC. Tank space needs for "in-tank washing" have been included. Spare and pretreatment receipt tanks are not shown. Beginning in 1999, a portion of the evaporator operational space maintained in Tanks 102-AW/106-AW will also be considered as spare space to decrease tank space needs. Levels of Dilute Non-complexed waste (DN) in the dilute receiver and evaporator tanks will vary with time. The bar for each year depicts the tank space needs for the end of that fiscal year and may not show tank space changes occurring during the fiscal year.

Numbered Comments for "Tank Inventory and Space" Graphic

1. "Watch List" tank inventories are constant from 1995-2005. It is assumed that complexed salt well liquid pumping in 200 West Area would be added to Tank 102-SY before the PT (PFP TRU) solids were retrieved (see note 9).

2. Space above Neutralized Cladding Removal Waste (NCRW) solids is routinely used to store Dilute Non-complexed (DN) waste. For clarity, the graph shows this DN inventory in with the other DN inventory toward the top of the graph. (i.e, to ascertain "free" space, add the space shown in the NCRW group to that shown in the DN group).

3. Space above PFP Tru (PT) solids is used to store DN waste, (see note 2).

4. In 1994 there is a step change in the space in the Concentrated Phosphate (CP) group (2 tanks). in 1993 the CP waste occupies part of two tanks. In 1994 the material is combined so that it all occupies only one tank; the space freed is then added to the DSSF group in 1994. This represents a transfer of a small amount of CP waste from Tank 106-AN to Tank 102-AP. In 1994, Tank 106-AN was used to store CC.

5. The CC (or DSSF) group shows increases in available space over time (e.g., 1994). When a CC tank becomes full, a new tank must be added, which obviously has empty space in it. This is shown graphically year-to-year with step increases in the number of CC tanks and variations in the available space shown in the group. Increase in CC volumes occur due to Salt Well Liquid (SWL) pumping.

6. In 1995 there is an increase in space above the Dilute Complexed (DC) waste inventory. This results from pumping the DC waste from Tank 101-AY (980 Kgal) to Tank 105-AP (1140 Kgal tank), thus creating more net headspace. Reduction in the DC waste inventory in 1996 is caused by an evaporation. Evaporation is necessary to prevent overfill of Tank 105-AP. Projection L956BC included approximately 2.1 Mgal of additional complexed SWL as compared to the previous projection for the 7/94 OWVP.

7. The increase in NCAW inventory and tank needs starting in 1995 were caused by in-tank washing of the NCAW solids. The final result of the operations were completed by the end of FY 2001 and included (See Table 4 for additional detail):

   - Washed NCAW solids from Tanks 101-AZ and 102-AZ were combined into Tank 102-AZ.

   - NCAW supernates and washes were evaporated and combined into Tank 101-AZ.

8. Increase in NCAW tank needs in 1997 results from the retrieval of Tank 106-C solids to Tank 102-AY and additional in-tank washing operations. Tank 106-C solids are high heat solids that have been added to the NCAW waste category (must be stored in aging waste tanks, e.g. 102-AY).

9. The PT (PFP TRU) solids from Tank 102-SY were cross-sited to Tank 103-AW beginning 12/98. Therefore, the PT waste category and space are eliminated by the end of FY 99.

10. NCRW solids from Tank 105-AW were retrieved to Tank 103-AW in FY 99. This resulted in a decrease in NCRW tanks by one tank by the end of FY 99. Tank 103-AW would contain 930 Kgal of solids after the solids in Tanks 103-AW, 105-AW, and 102-SY have been consolidated.

11. Retrieval of Single-Shell Tank solids (SSTS) was started in FY 2004 in TX farm. Initial SSTS were stored in Tanks 101-AN and 102-SY.

12. Decrease in DSSF inventory in FY 2005 results from pretreatment and vitrification.

13. Increase in NCAW inventory and tank needs caused by addition of HLW receipt tank needed for pretreatment.

14. CP waste is pretreated in FY 2006 and this category is eliminated.

15. Increase in "Watch List" tank needs caused by dilution prior to pretreatment. Decrease in "Watch List" inventory and tank needs in FY 2006 results from pretreatment and vitrification. This category is eliminated by FY 2008.

16. Decrease in CC inventory results from pretreatment and vitrification.

Interpretation of Short Range Projection Results

This section provides an interpretation of detailed short range projection results. The OWVP presents certain information in the form of graphics. A number of these graphics show 12 months of historical operations and 24-48 months of projected operations. Most of the vertical axis represents thousands of gallons of waste generated. An example of this type of graphic is the facility waste generation graphic. The volume generated per month for each facility is depicted on a facility waste generation graph. An example of the facility waste generation graph for PUREX miscellaneous waste is shown below (Figure 5).

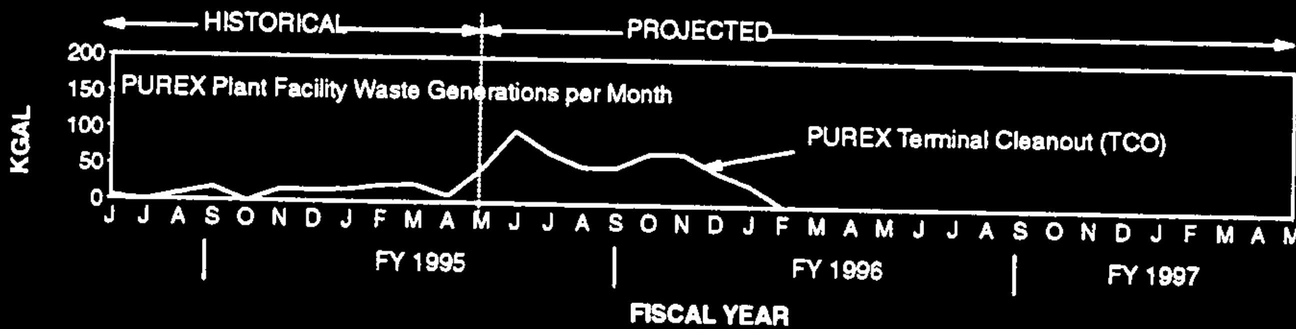


Figure 5. Facility Waste Generation Graphic

In the computer simulation, facility waste streams are routed to a receiver tank. A tank fill graphic shows the filling of the receiver tank and is on the same page as the facility waste generation graph of the waste stream it receives. The tank fill graphic shows the rate a specific tank is filled with waste. Usually when a receiver tank is full, waste is transferred to a holding tank. This waste is either evaporated or stored for future disposal. For every transfer out of a tank, there is a corresponding receipt of the same volume into another tank or facility. For every evaporation out of a tank there is a corresponding receipt of the more concentrated waste in the receiving tank and an increase in the condensate from the 242-A Evaporator being sent to the LERF.

An example of this type of graph (a tank fill graphic) for Tank 105-AW is shown below (Figure 6).

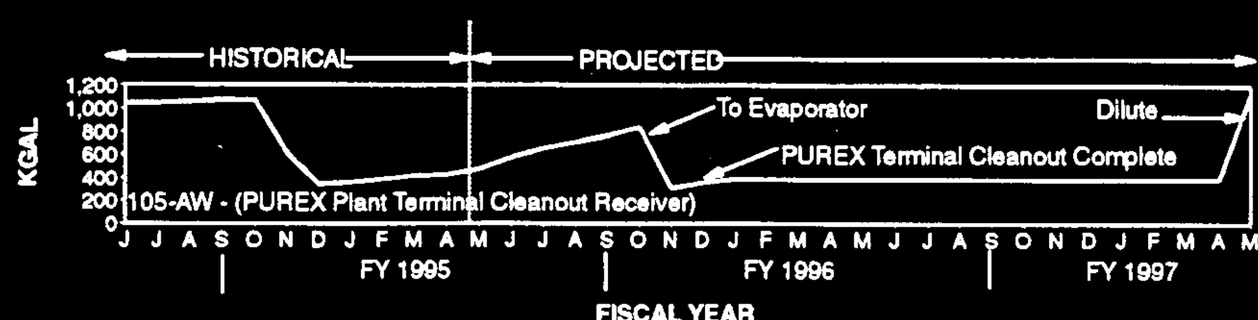


Figure 6. Tank Fill Graphic

The accuracy of this projection is directly related to the facility supplied assumptions. Some of the major assumptions are listed below:

- o Process operating schedules define the planned dates of plant operations or deactivation activities. These assumptions are consistent with the TWRS program planning. Volumes and schedules for the various Hanford facilities for the three projection cases are presented in Sections 3 and 4.

- o Plant waste generation assumptions define the volume and type of waste that will be generated by the plants. These assumptions result from an analysis of recent waste generation history and future plans specified by the plants. Most waste streams volumes are projected based on historical data and/or facility supplied operating schedules. Section 5.4 includes a comparison of actual waste receipts to the new facility waste generation targets for the period October 1994 to June 30, 1995.

Tank roles and waste routings define the use of tanks in the system. For example, a tank will be designated to act as receiver of the PUREX facility miscellaneous waste (Tank 105-AW), while other tanks will store concentrated waste.

The graphics depicted on the next few pages summarize the short range projection results of the Baseline Case. Figure 7 shows the role of each tank during the first four years of the projection. It should be noted that if a tank has several transfers in or out of the tank in one month, no fluctuation in the tank level may appear. This is because the graphic program plots tank levels as of the last day of the month and any changes that occur during the month are not shown. The simplified routing schematic shown in Figure 8 depicts the assumptions that are made about the routing of waste from the plants to the tanks and from tanks to the facilities.

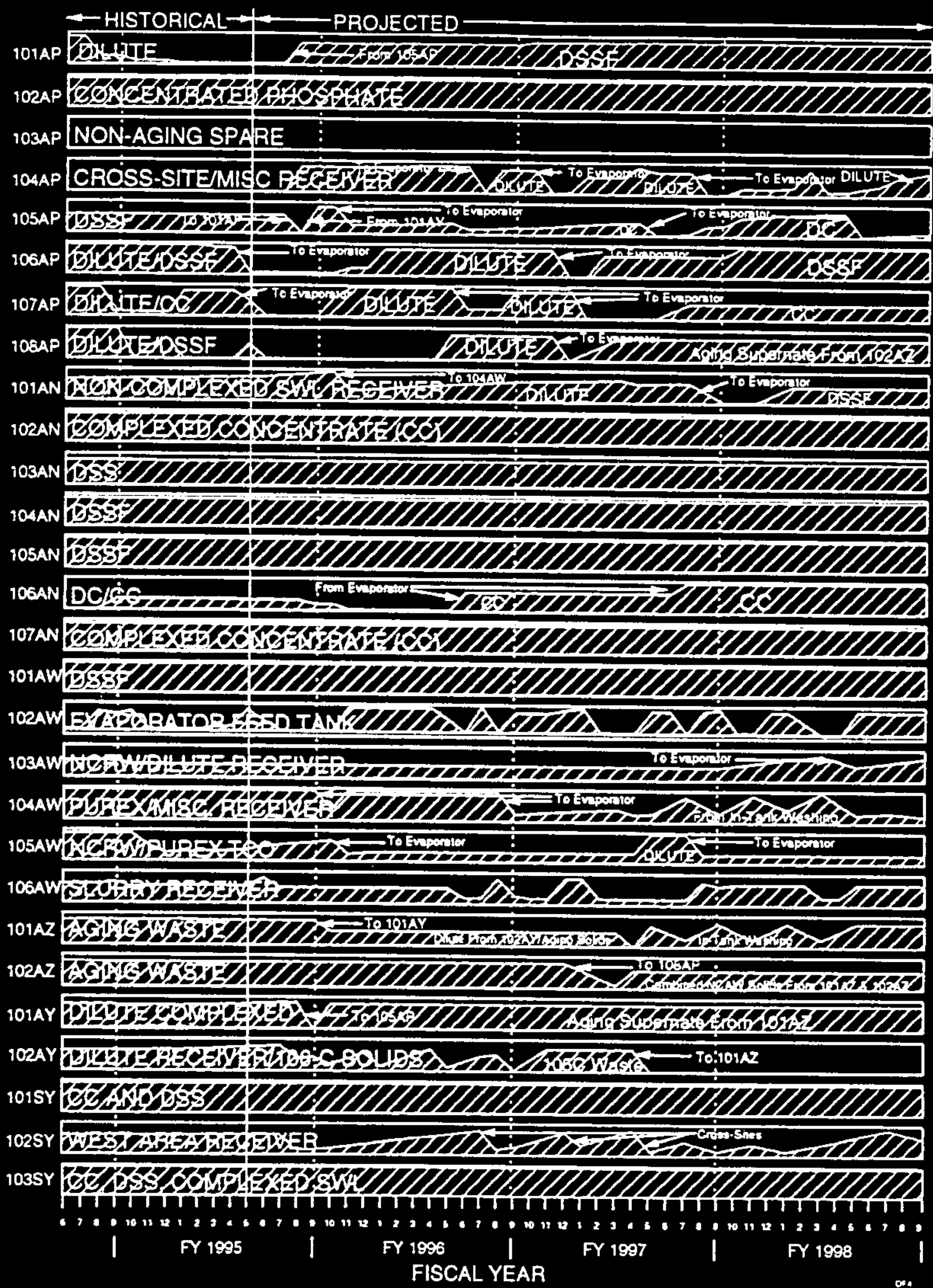


Figure 7. Tank Levels During Four-Year Projection

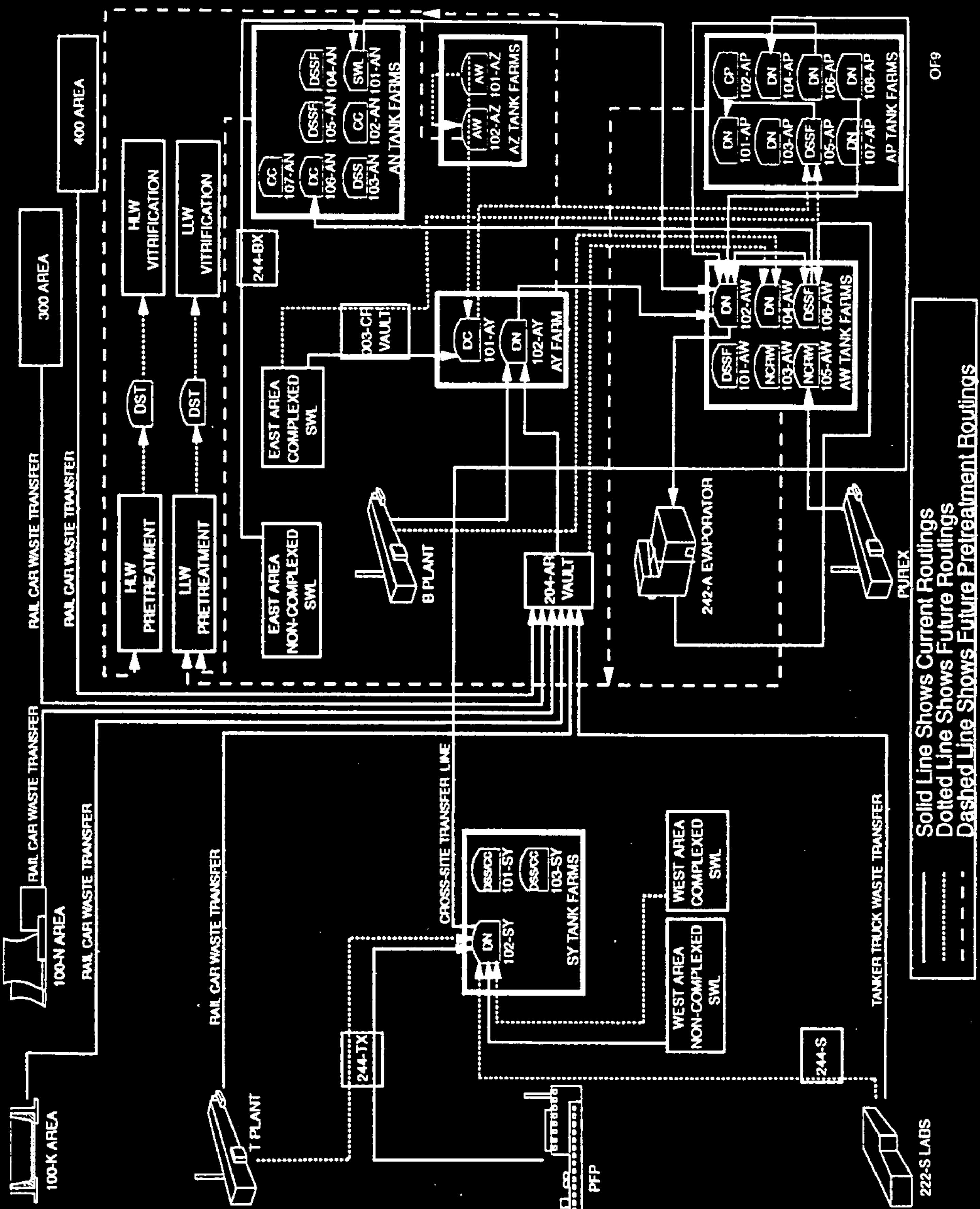


Figure 8. Simplified Schematic of Current and Planned Routings

The results of this projection are forecasts of evaporator operations, LLW pretreatment and disposal, HLW pretreatment and disposal, and an analysis of tank space issues for aging and non-aging waste tanks.

Evaporator WVR and LERF Condensate

Schedule and operational considerations presented in Section 3 result in the following Evaporator Waste Volume Reduction (WVR) and LERF Condensate production volumes for the Baseline Case. Operating experience obtained during the first evaporator campaign in 1994 indicate that approximately 1.26-1.3 gallons of condensate will be sent to the LERF for every one gallon of WVR. The projected Evaporator WVR and volumes sent to LERF in Table 11 are calculated based on the 1.3 gallon condensate/gallon WVR factor. These volumes also assume that there that there will be no evaporator outages before 2015.

Table 11. Evaporator WVR and LERF Additions for the Baseline Case

FISCAL YEAR	EVAPORATOR WVR	CONDENSATE TO LERF
1995	4950	6330
1996	2510	3260
1997	5650	7340
1998	2310	3000
1999	2660	3460
2000	1300	1690
2001	890	1160
2002	680	880
2003	550	710
2004	550	710
2005	550	710
2006	540	700
2007	440	570
2008	350	450
2009	340	440
2010	340	440
2011	340	440
2012	380	490
2013	380	490
2014	380	490
2015	620	800

See Figure 9 for dilute receiver tanks, evaporator WVR, and the 242-A Evaporator operating schedules for the Baseline Case.

Based on the 1.3 gallon condensate/gallon WVR factor, scheduled evaporator operations would not fill the LERF before the Effluent Treatment Facility startup in November 1995. There should be sufficient LERF and DST space for storage of Hanford facilities generated waste between June 1995 and November 1995 when the LETF is available, provided:

- the 242-A Evaporator schedule is achieved
- the amount of condensate sent to LERF does not exceed the 1.3 gallon condensate/gallon WVR factor
- facilities stay within there respective generation limits
- no unexpected waste receipts are received in the DSTs

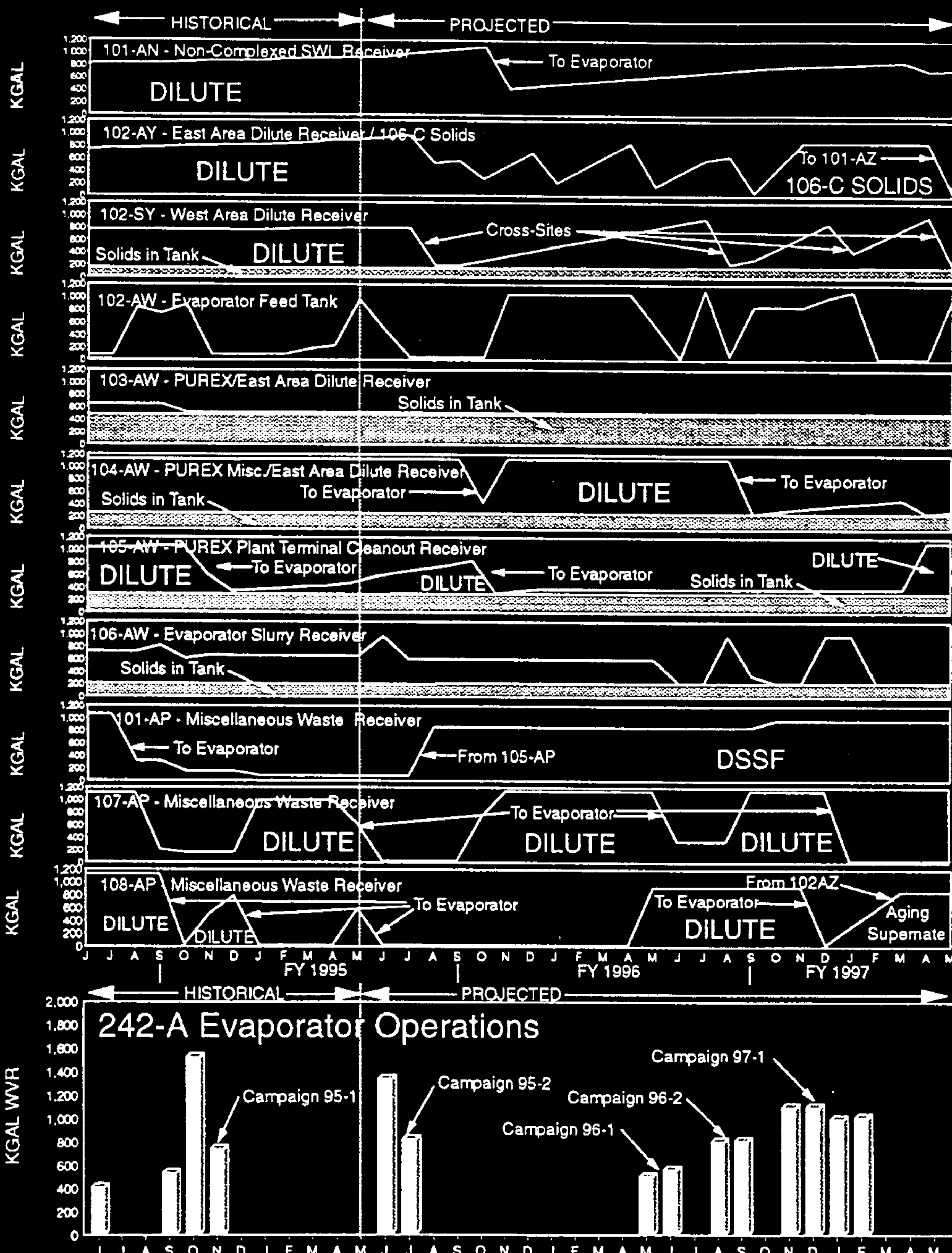


Figure 9. Dilute Receiver Tanks and 242-A Evaporator Operations

DF10

NON-AGING TANK SPACE

In later parts of the projections when tank space becomes tight due to pretreatment needs and/or the amount of SST solids being retrieved, the evaporator is assumed to operate yearly to minimize waste storage needs. Tank space pinches occurring between FY 1999 and FY 2015 (Figure 3) are caused by a combination of factors, including:

- SWL pumping (SST stabilization) volumes pumped by the end of FY 2000
- This projection case assumed that two "clean" pretreatment receipt tanks would be required in FY 2005
- The large volume of SST solids retrieved beginning in FY 2004
- Decision not to operate the Grout Facility has eliminated an early means of freeing up DST space

Figures 10 through 14 show the operation of most of the DST waste tanks for the Baseline Case projection.

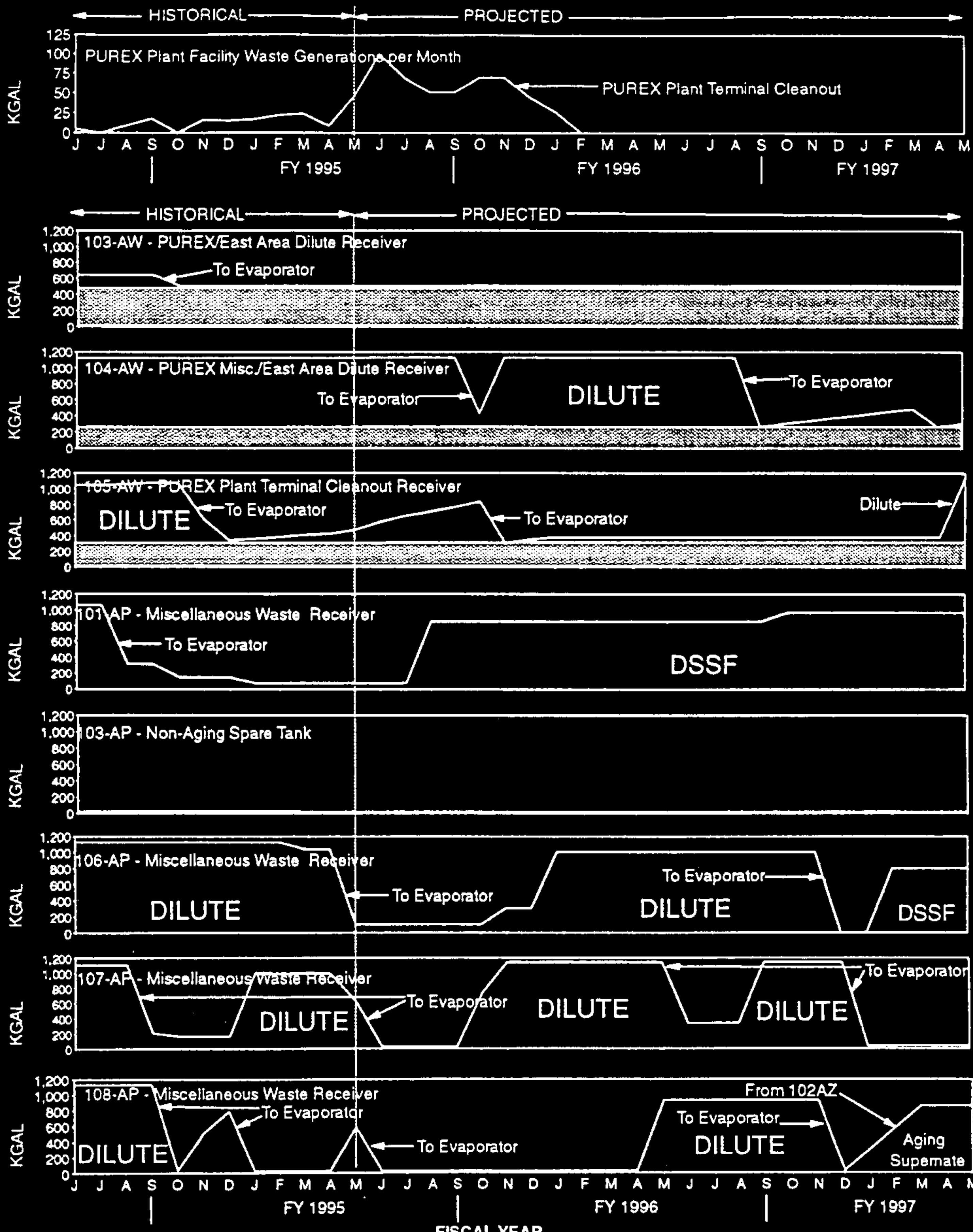


Figure 10. PUREX Facility Waste Generations and Tank Levels

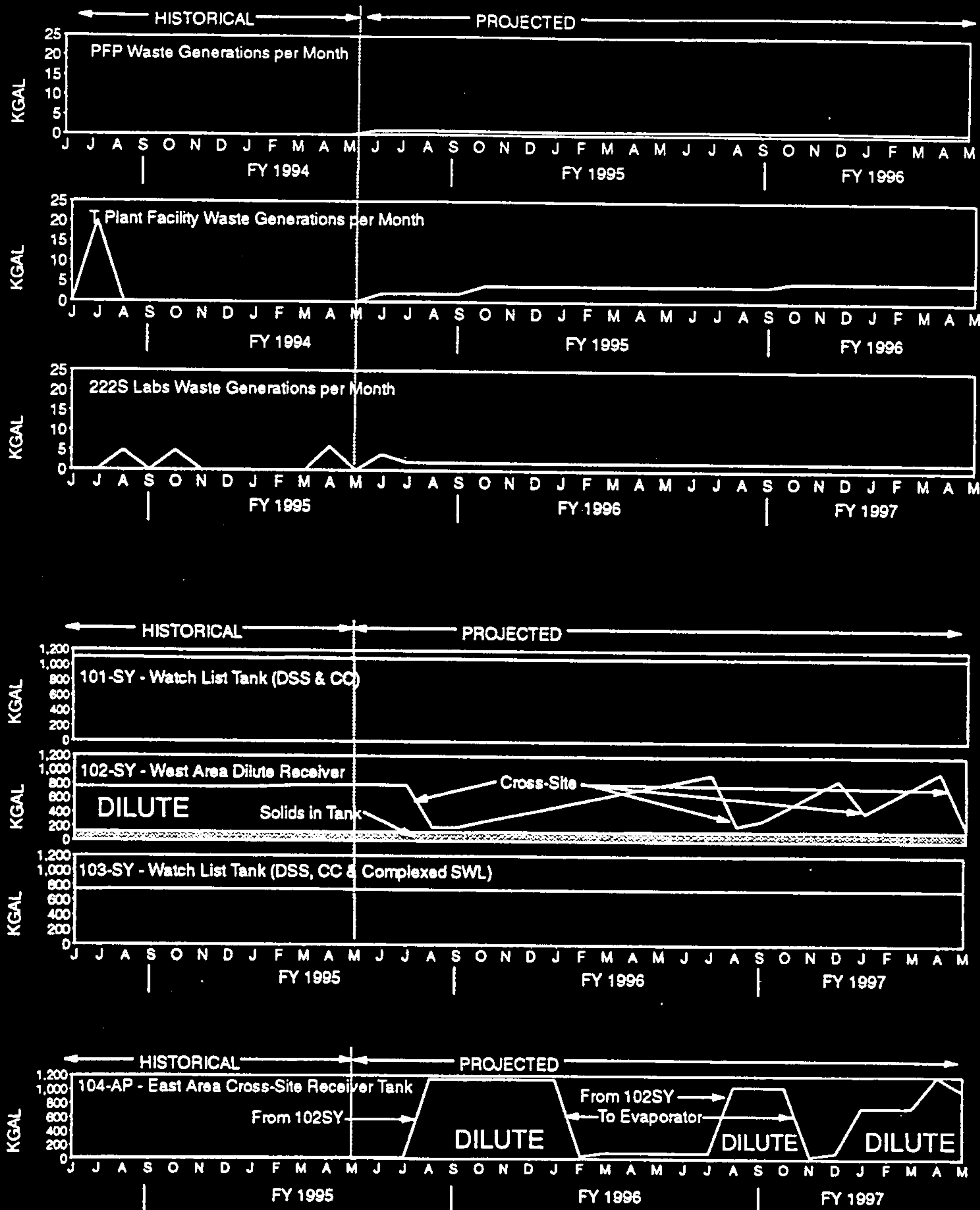
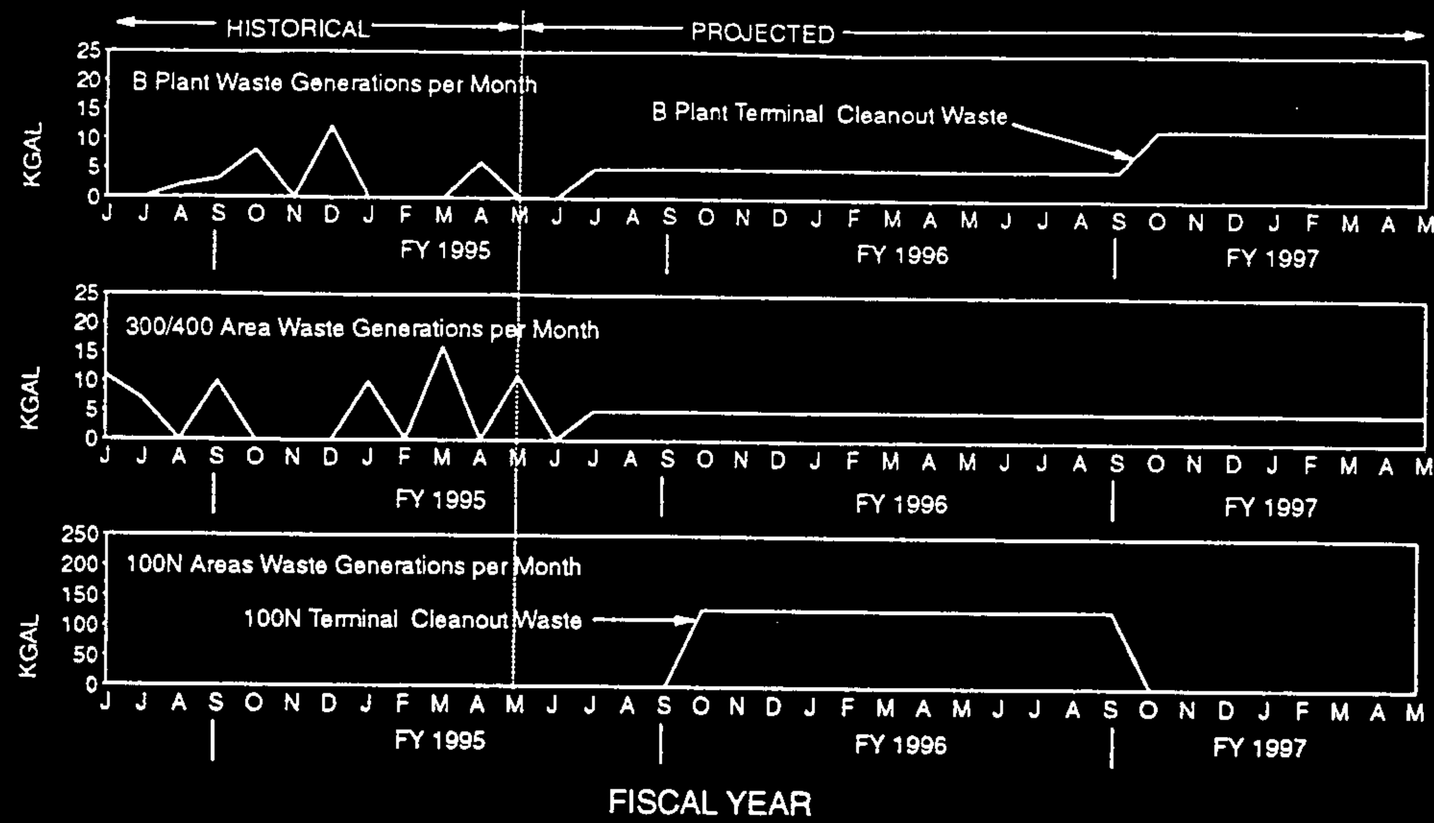


Figure 11. West Area Waste Generations and Tank Levels

OF12



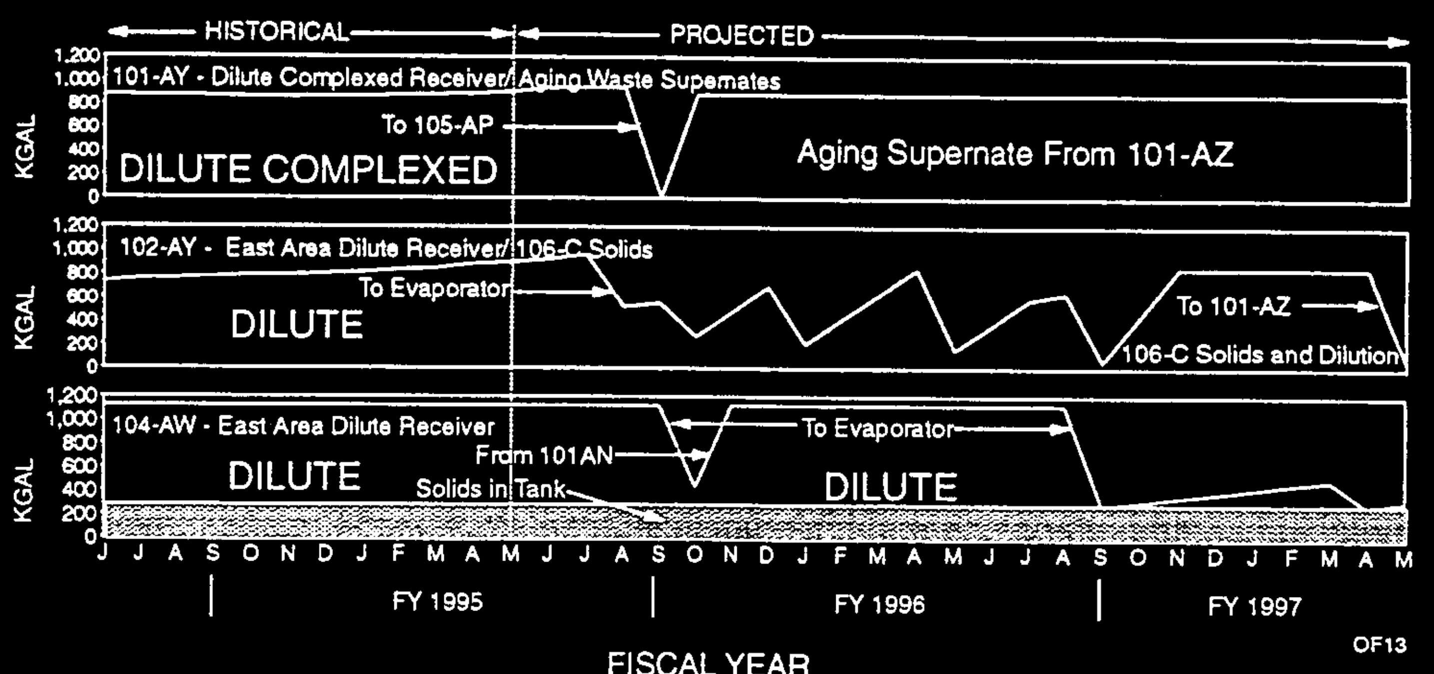


Figure 12. B Plant and Hanford Facility Waste

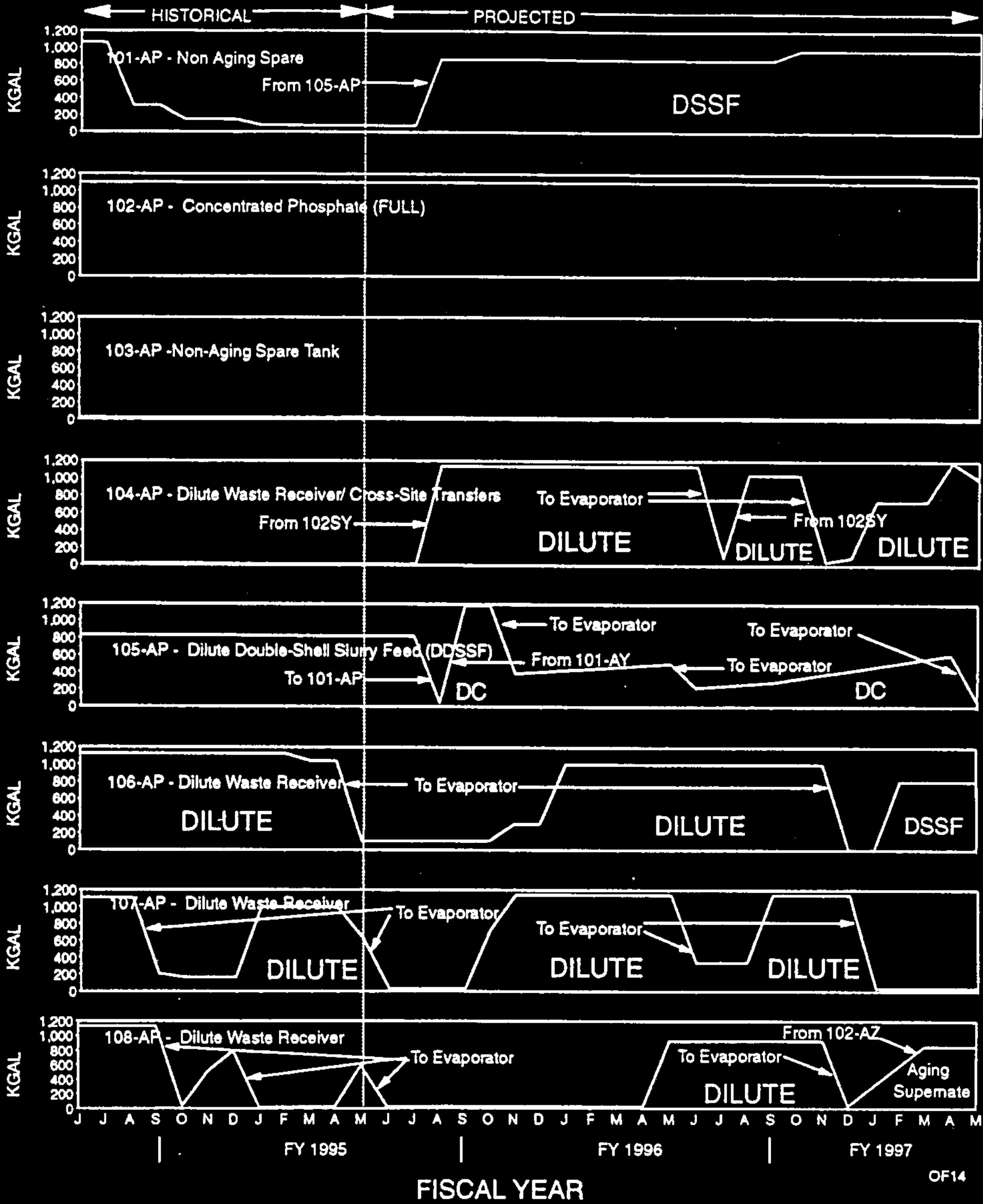


Figure 13. AP Tank Farm Levels

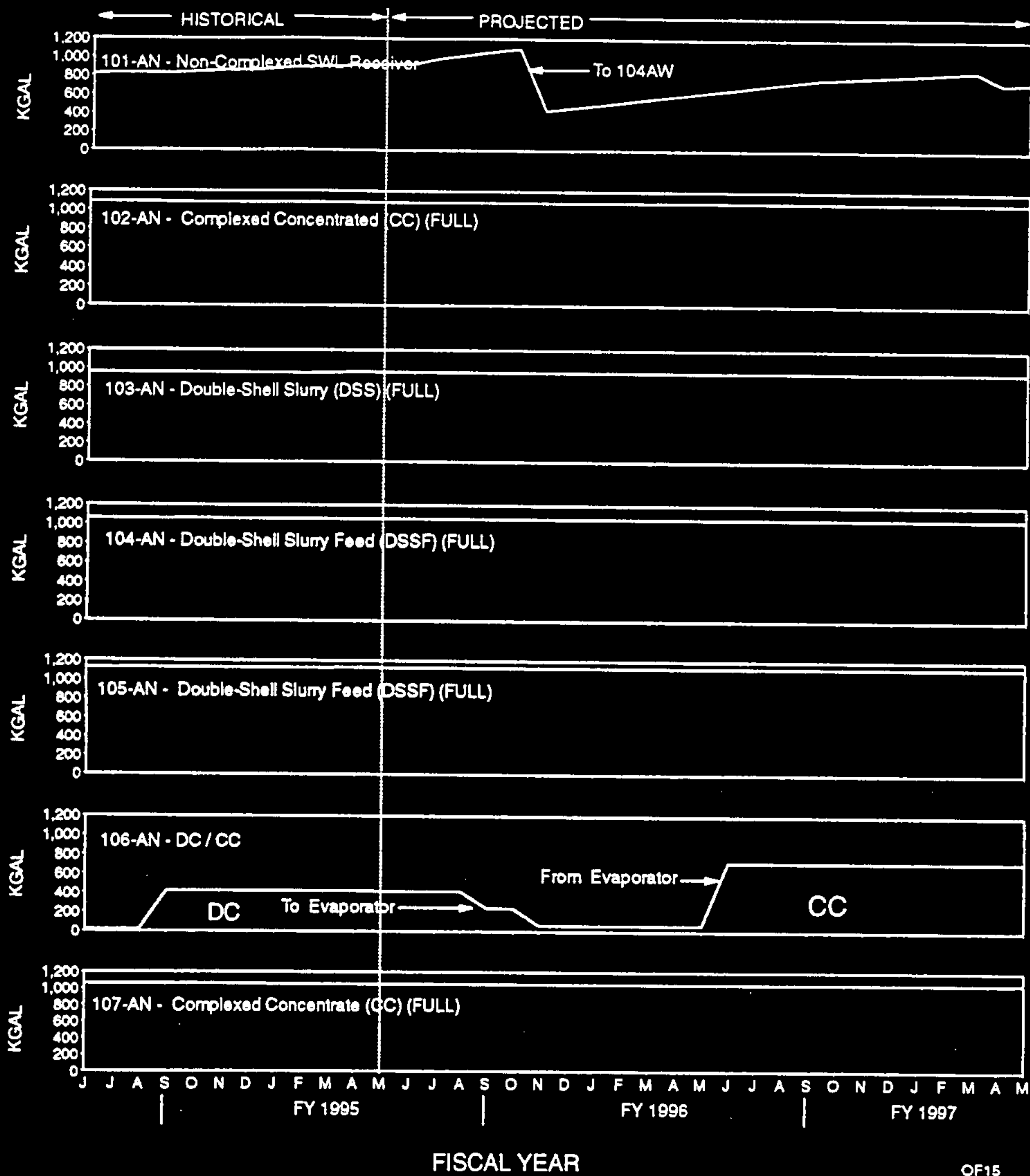


Figure 14. AN Tank Farm Levels

AGING WASTE TANK SPACE

It is assumed that the PUREX facility will not restart. With PUREX not restarting only two aging waste tanks (Tanks 101-AZ and 102-AZ) are required to store existing aging waste.

One additional aging waste tank will be required to retrieve and store the contents of Tank 106-C (a SST containing high heat waste). Waste from Tank 106-C is assumed to go to Tank 102-AY in FY 1997. This may cause a problem for final disposal of the contents of Tank 102-AY if the heel in Tank 102-AY is high in chlorides as indicated by initial characterization studies.

The In-Tank Washing Scenario adopted for the Baseline Case (MacLean, 1995) assumed that the washed solids from Tanks 101-AZ, Tank 102-AZ, and Tank 106-C could be washed and combined in one aging waste tank (Tank 102-AZ). Likewise, aging waste supernates were concentrated and combined in one aging waste tank (Tank 101-AY). Consolidation of all NCAW solids in one tank may not be achievable if the combined solids level/heat load exceed OSR limits. Likewise, combination of all NCAW supernates into one tank may not be achievable since the supernates would have to be concentrated to greater than 5 M Na. Studies are being completed to address these and other issues. By 2001, these operations result in one aging tank being used to store washed solids for HLW vitrification; one aging tank used to store combined supernates; and one aging tank being used as spare space--saving one tank over previous projections. A graph of aging waste tank space requirements as a function of time is presented in Figure 15. The uses of each individual aging waste tank for the Baseline Case are shown in Figure 16.

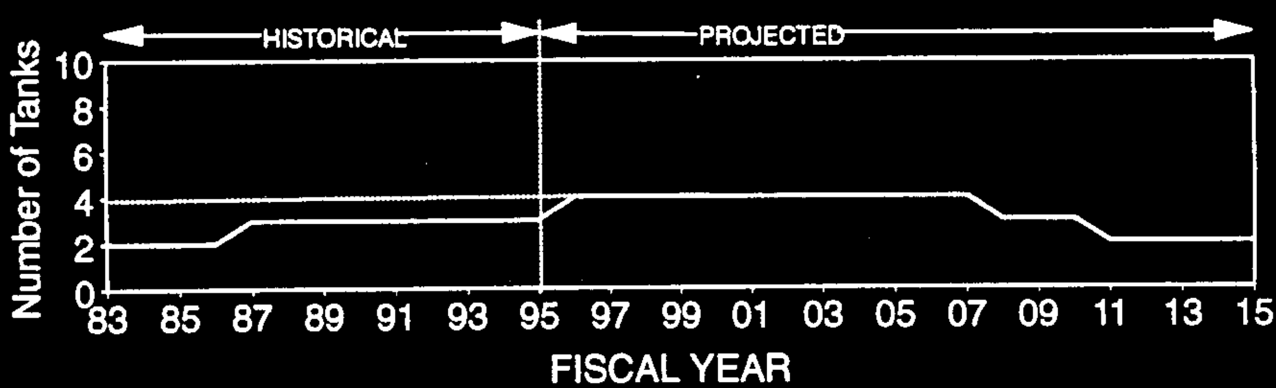


Figure 15. Aging Tank Requirements

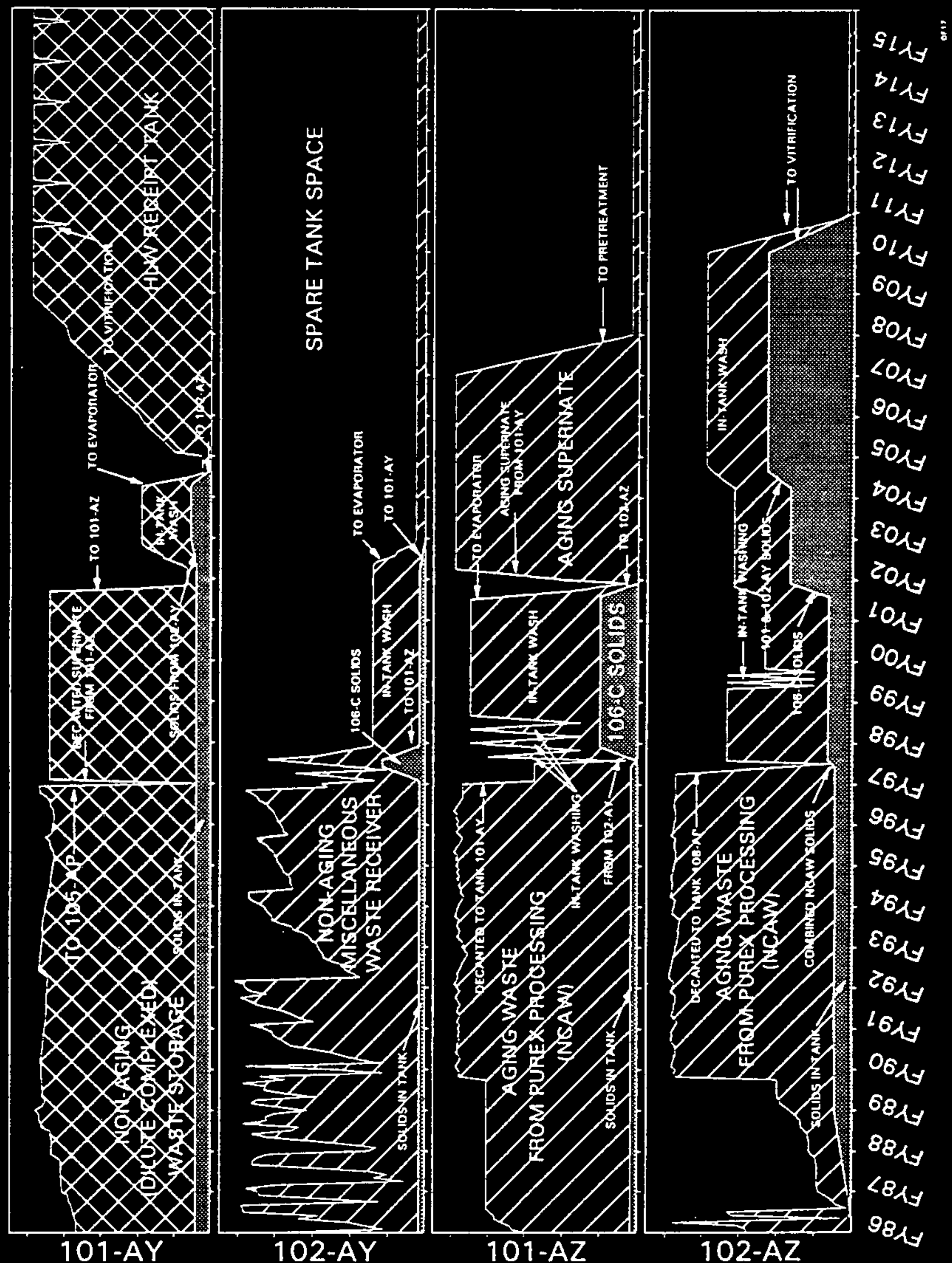


Figure 16. Aging Waste Tank Usage

5.2 Ecology Case Results and Conclusions

Tank space needs for the Ecology Case are shown in Figure 17. Results from this projection would require one of the following actions to allow the 1:1 dilution of Tanks 101-SY and 103-SY in FY 1998 and 2000, respectively without exceeding available tank space:

- o the construction of one new tank in the 200 West Area
- o decrease in the SWL pumping schedule in FY 1999-2000

By the end of FY 2006, the Baseline Case has also diluted these tanks to allow the tanks to be retrieved and pretreated and as expected the plotted tank space needs for the two cases are nearly identical. The small increase in tank space required for the Ecology Case from FY 2007 to 2015 as compared to the Baseline Case is caused by the slight increase in DSSF inventory (concentrated waste) caused by the evaporation of the additional 5.45 Mgal of dilute waste assumed to be received from 100-K Basin for the Ecology Case. Part of the increase is offset by the decrease in spare space (2.28 Mgal decreased to 2.12 Mgal) for the Ecology Case.

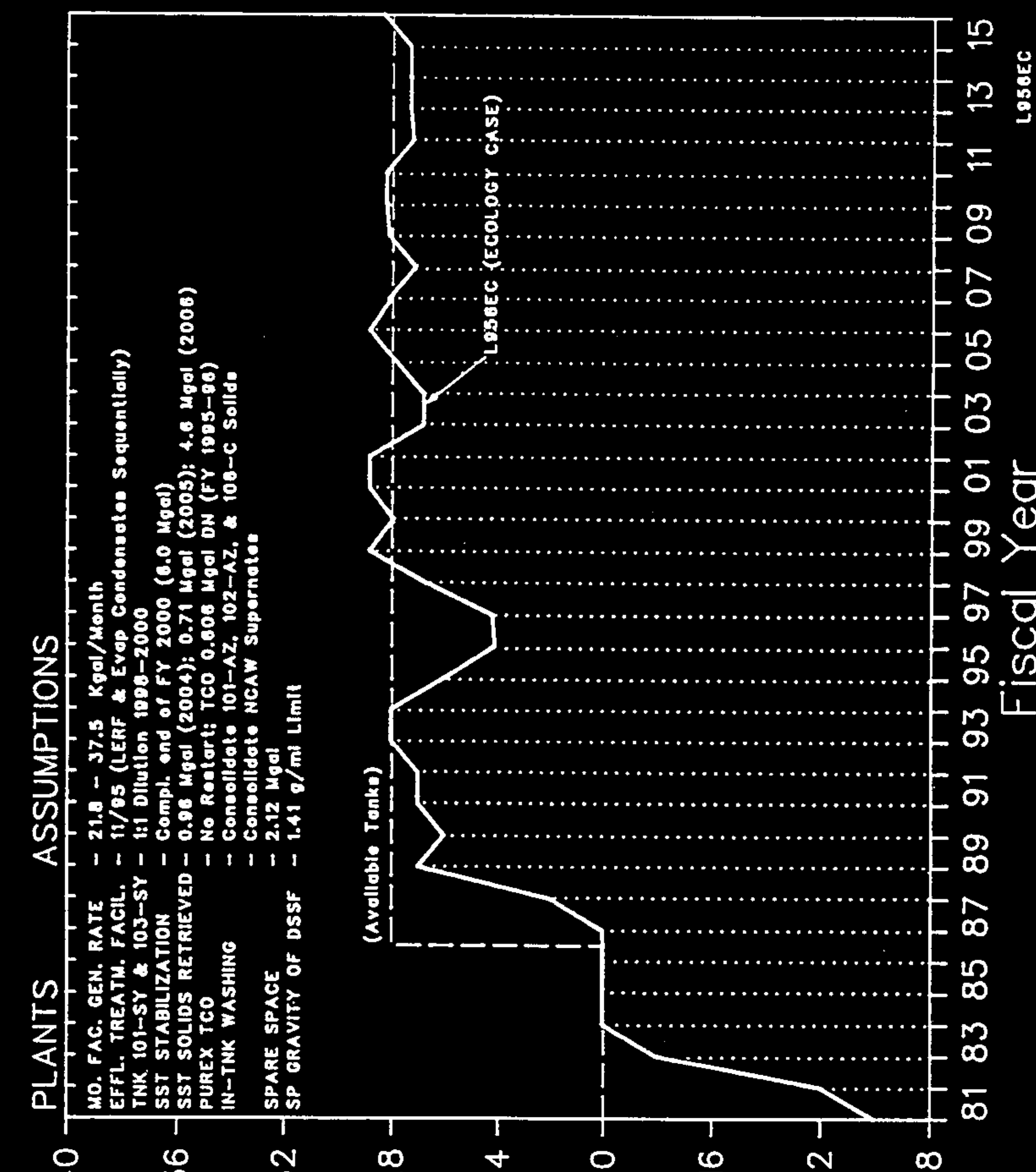


Figure 17. Double-Shell Tank Requirements for the Ecology Case

5.3 Alternate Acquisition Strategy Case Results and Conclusions

At the time this projection was completed, the Alternate Acquisition Strategy assumptions had not been finalized and the assumptions used in this projection are subject to change.

Projected tank space needs for the Alternate Acquisition Strategy Case are shown in Figure 18. This projection filled available tank space by FY 2006 and was truncated. The increased tank space requirement compared to the Baseline Case is caused by the lower pretreatment rate and the large volume of retrieved SST solids being retrieved starting in FY 2004. The private contractor would be required to match retrieval and processing capacity or build new tanks. Results from this projection would require one or more of the following actions to avoid over filling available DST space by the end of FY 2006:

- provide contract incentives for faster/earlier waste disposal
- reduce the rate of SST solids retrieval (TPA milestones)
- increase the pretreatment rate or workoff schedule for Phase I in the period 2001 to 2006 to empty more DST space
- initiate Phase II earlier to increase the pretreatment rate
- build additional DSTs

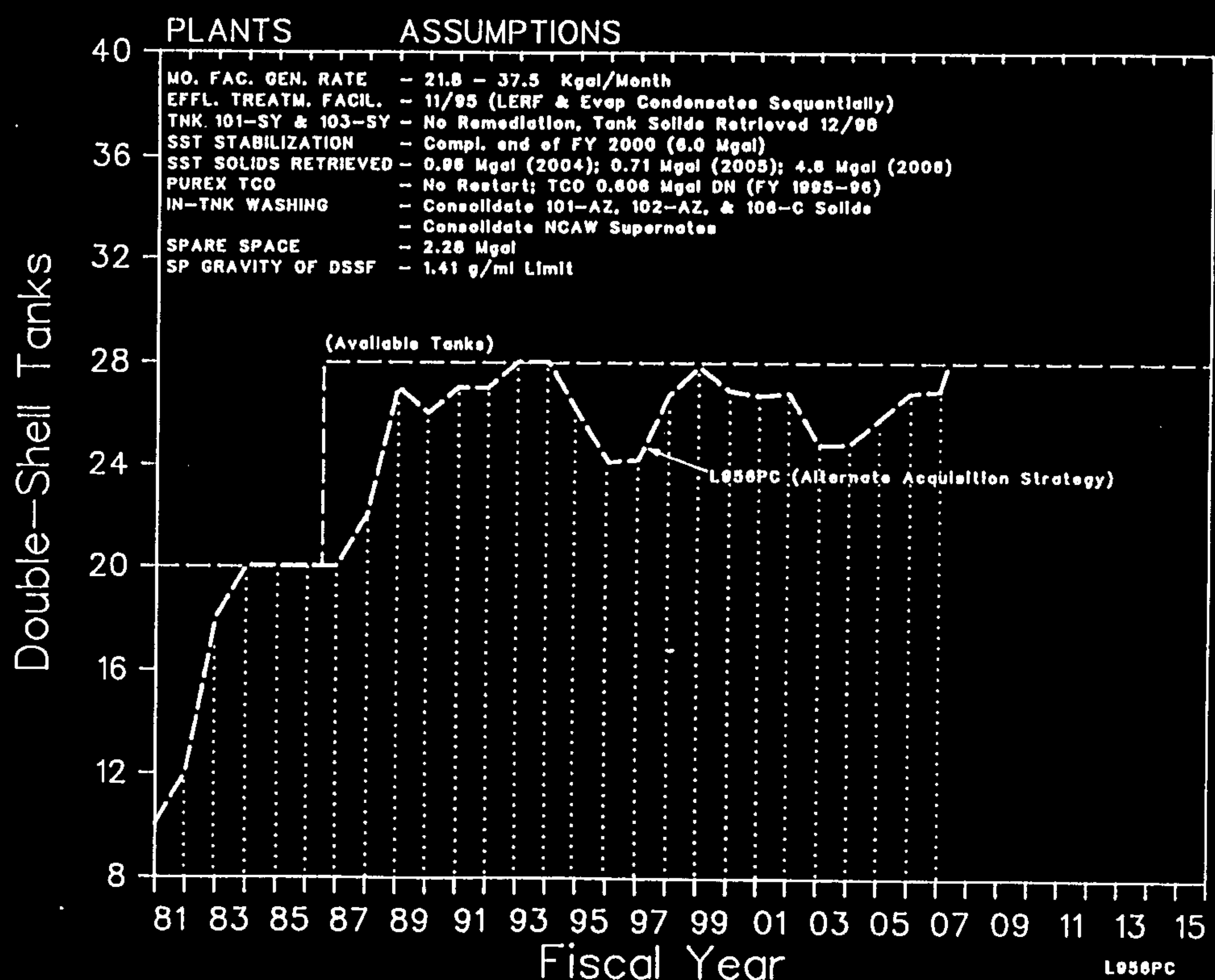


Figure 18. Double-Shell Tank Requirements for the Alternate Acquisition Strategy

5.4 Actual Waste Generation Compared to Management Limits

During the Tank Space Management Board (TSMB) meeting on August 7, 1991, the need to establish new facility waste generation limits was discussed with the Hanford facility representatives based on additional delays in the 242-A Evaporator restart. A new total monthly waste generation rate of 64 Kgal/month was adopted based on: discussions with facility representatives, the average monthly waste generation rate for each facility during FY 1991, and the need to provide contingency space for potential delays in the 242-A Evaporator restart.

Facility generation limits were not established for high priority waste generations, which were assigned to "Priority Space". These generations included the PFP stabilization campaign (safety), SWL pumping (TPA milestone), and the 242-A Evaporator (space necessary for the mini-run and restart).

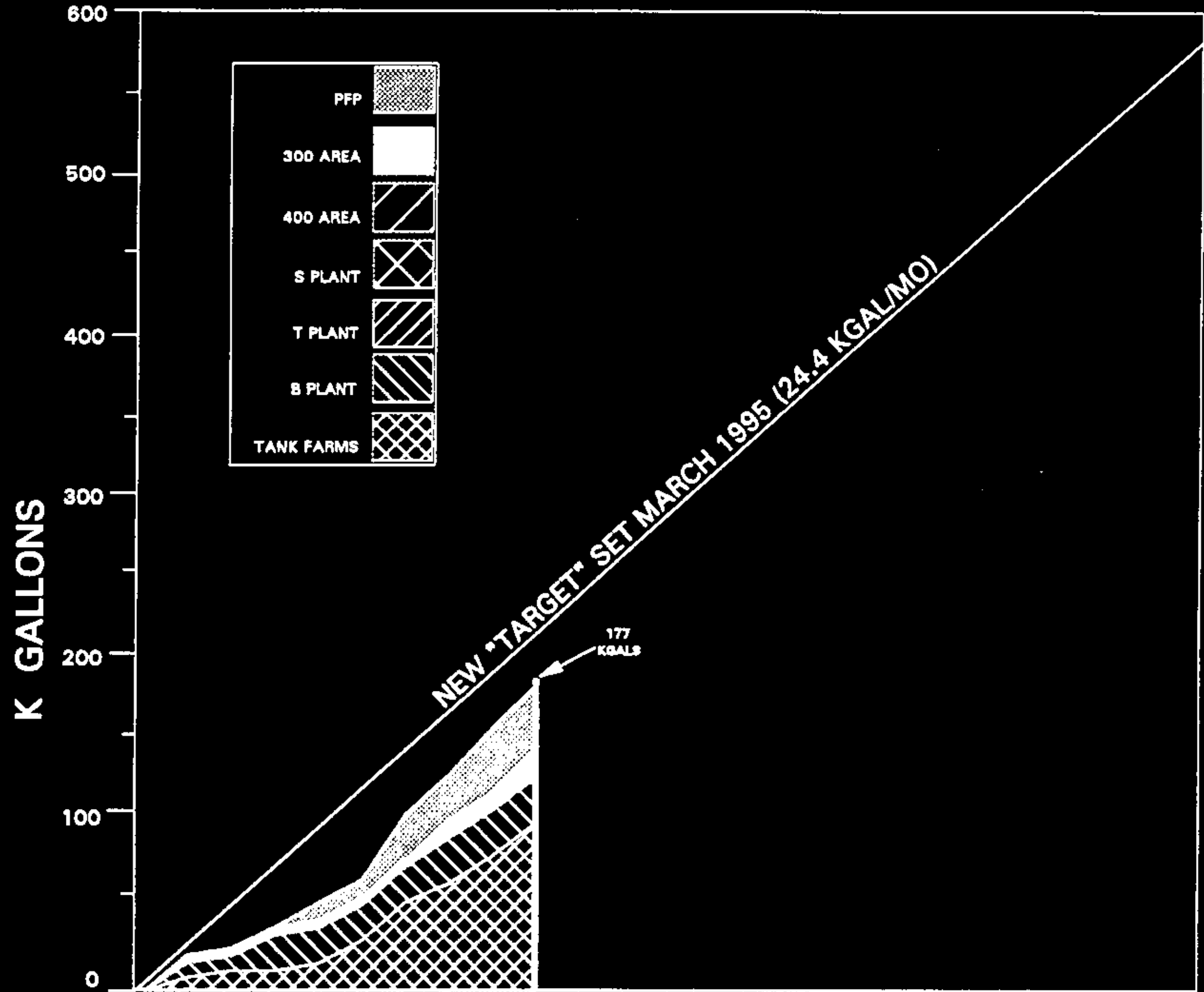
New average monthly waste generation targets have been established for this projection with waste generations being reduced by the facilities (references and discussion in Section 3). Table 12 presents a comparison of the previous limits established for each facility, the newly established target rates for this projection, and the actual average monthly waste generation rate (Kgal/month) for the period October 1994 through June 30, 1995.

Table 12. Comparison of Average Monthly Waste Generation Rates to the New Waste Generation Limits (Kgal/month)

FACILITY	64 KGAL/MONTH MANAGEMENT LIMIT FROM OWVP REV. 20	24 KGAL/MONTH FACILITY TARGET FOR REV. 21	AVERAGE MONTHLY FACILITY GENERATIONS (10/94 - 6/95)
TANK FARMS	10.0	10.0	9.9
B PLANT	23.0	5.0	2.9
T PLANT	6.0	2.5	0.0
S PLANT	5.0	1.9	1.9
300 AREA	5.0	4.5	4.1
400 AREA	0.0	0.5	0.0
TOTAL	64.0	24.0	18.8

\# Monthly Totals do not Include 100 N Area one-time Waste or Terminal Clean-out Volumes

Due to the commendable efforts by the Hanford facilities, all waste generators are at or below their new waste generation target for the period October 1994 through June 30, 1995. A comparison of the volumes of waste entering the DST tank space for that time frame is compared graphically to the various targets or projected generations in Figures 19-22. Actual facility holdups or stored waste as of June 30, 1995 are presented in Table 13.



	TARGET	10/94	11/94	12/94	1/95	2/95	3/95	4/95	5/95	6/95	7/95	8/95	9/95	10/95	11/95	12/95	1/96	2/96	3/96	4/96	5/96	6/96	7/96	8/96	9/96
PFP	0.5	0	0	0	0	0	0	0	0	0															
300 AREA	4.5	0	0	0	10	0	16	0	11	0															
400 AREA	0.5	0	0	0	0	0	0	0	0	0															
S PLANT	1.9	5	0	0	0	0	0	6	0	6															
T PLANT	2.5	0	0	0	0	0	0	0	0	0															
B PLANT	5	8	0	12	0	0	0	6	0	0															
TANK FARMS	10	8	4	0	4	13	22	11	16	19															

NOTE: THIS GRAPHIC DEPICTS CONTRIBUTIONS FROM FACILITY GENERATION. TERMINAL CLEAN-OUT AND SWL PUMPING IS NOT SHOWN

Figure 19. Monthly Facility Generations

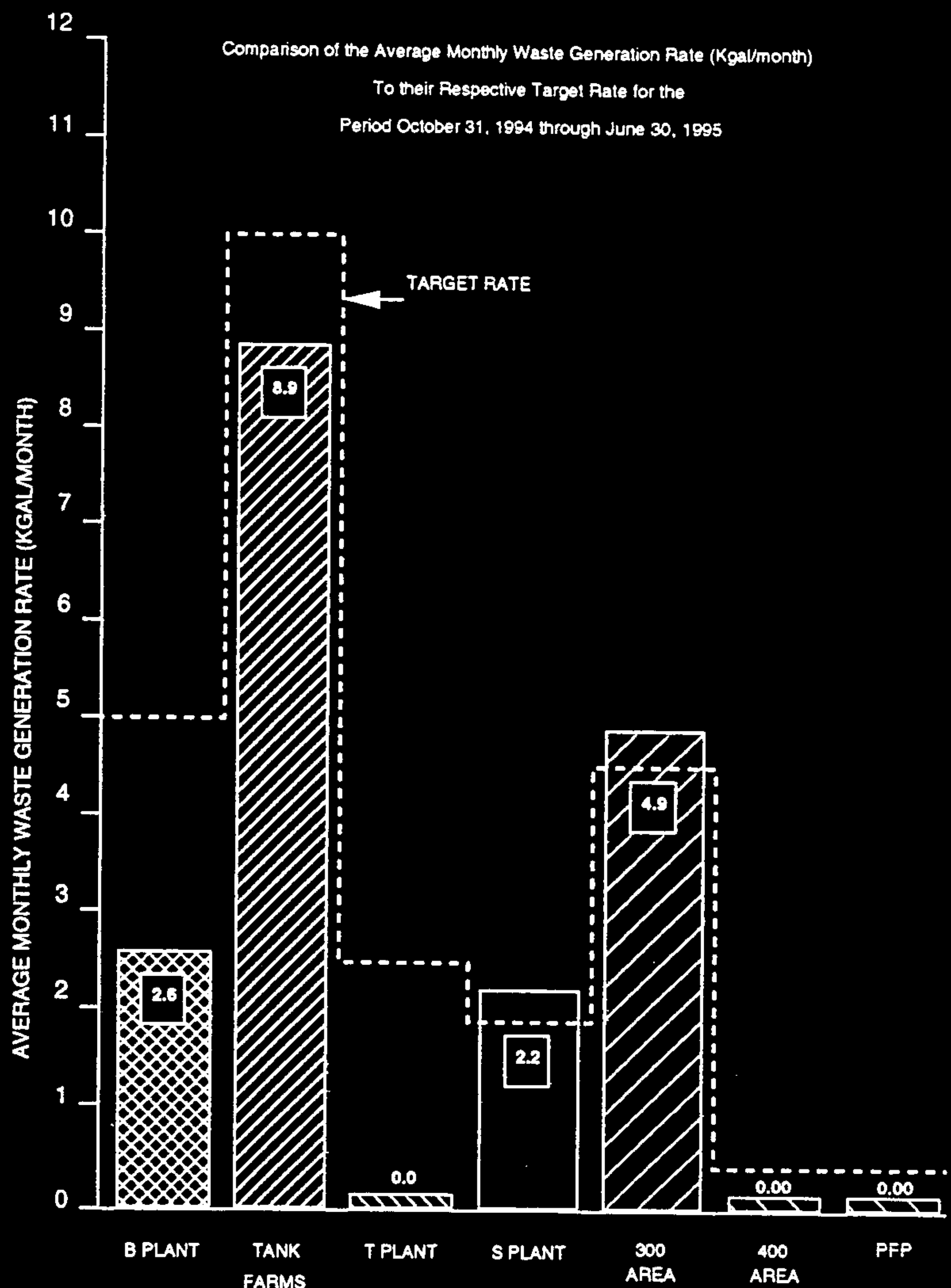
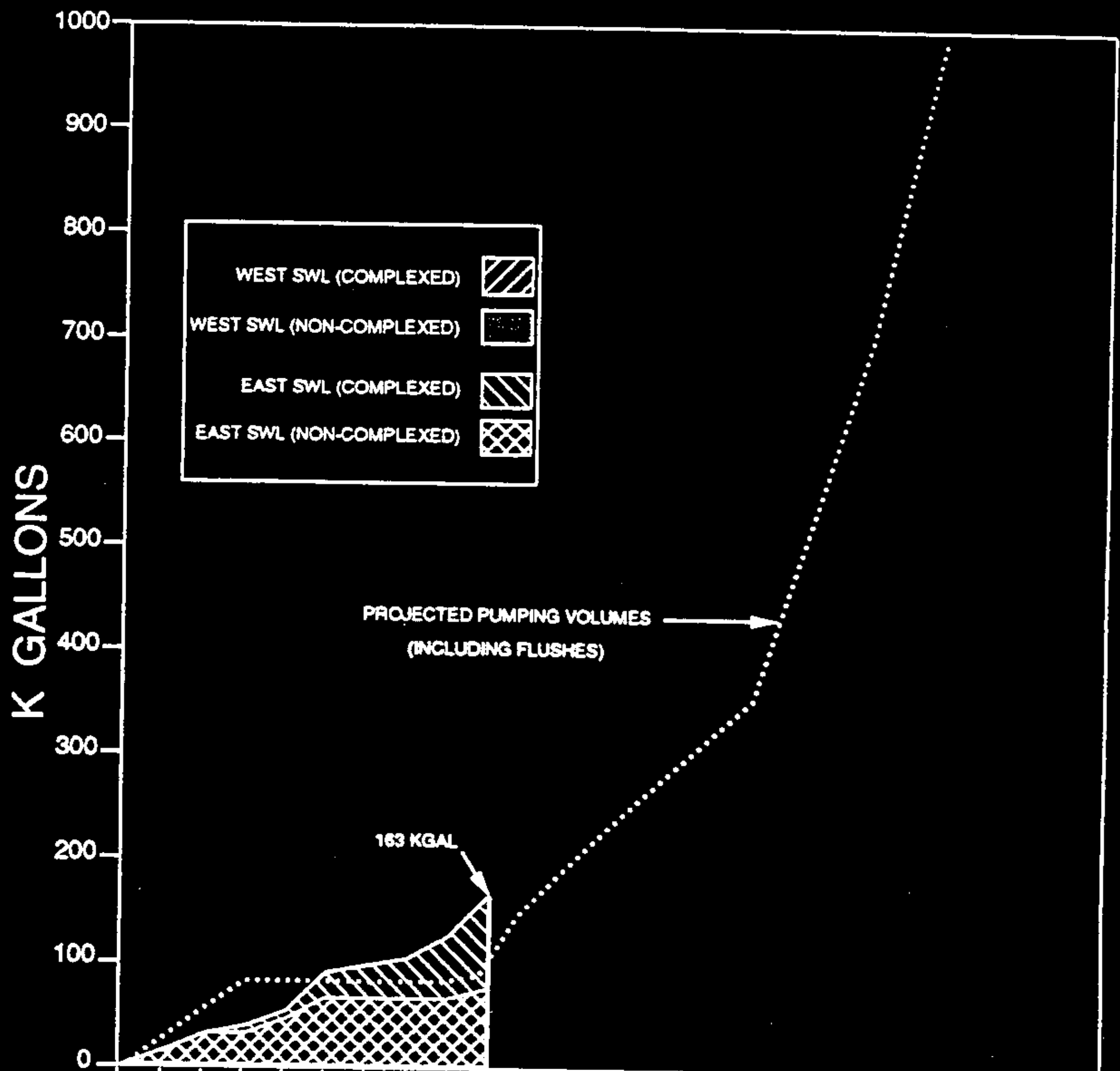


Figure 20. Comparison of Monthly Average Waste Generation To Target Rate



	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
WEST SWL (DC)	0	0	0	0	0	0	0	0	0															
WEST SWL (DN)	0	0	0	0	0	0	0	0	0															
EAST SWL (DC)	0	0	7	0	17	7	7	21	30															
EAST SWL (DN)	14	16	0	14	20	0	0	0	10															
	FY 1995												FY 1996											

OF20

Figure 21. Contributions From Salt Well Liquid Pumping

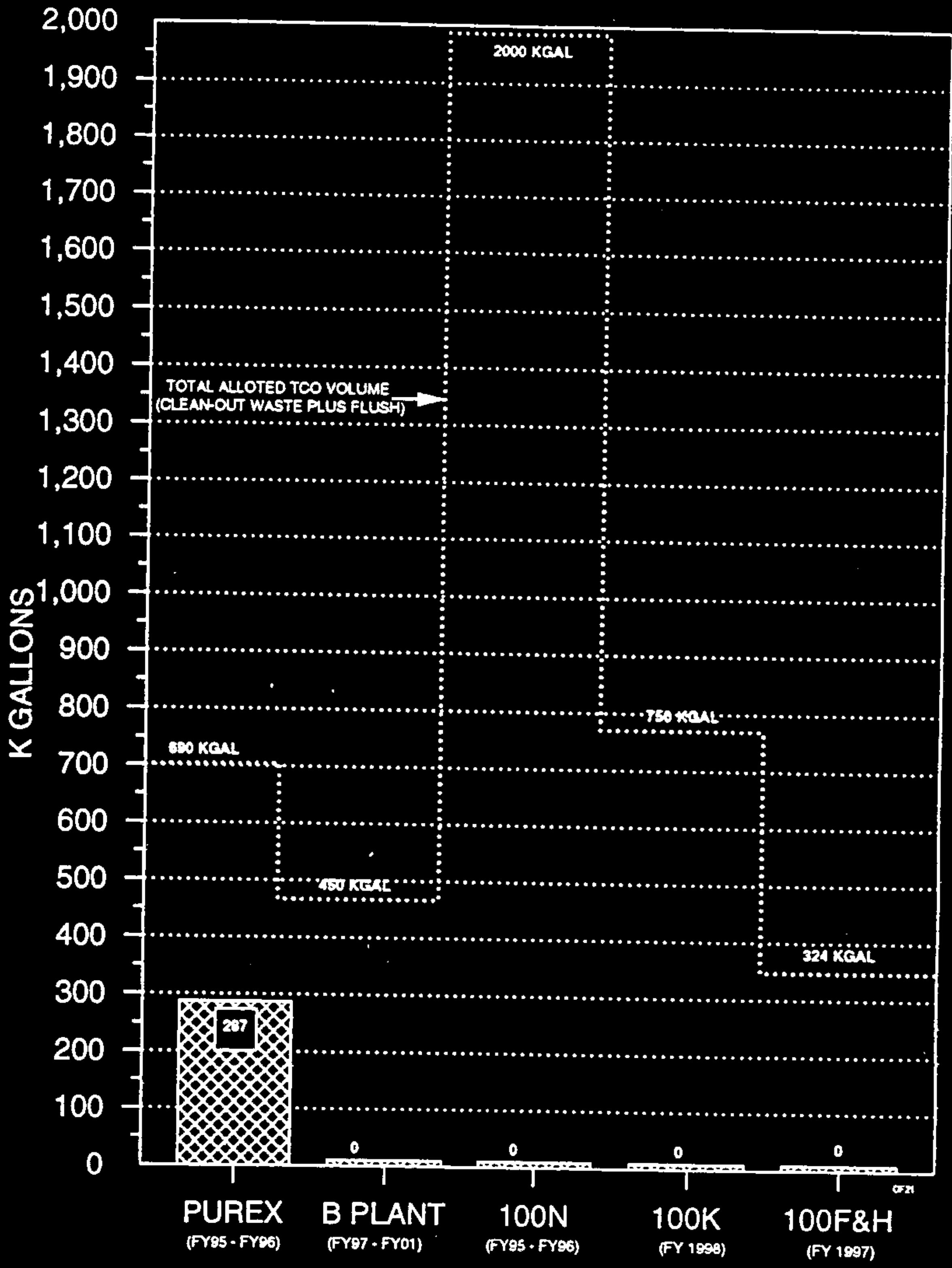


Figure 22. Contributions From TCO (June 30, 1995)

Table 13. Facility Waste Storage and Capacity in Kgal as of June 1995

FACILITY	ACTUAL HOLD-UP	WASTE STORAGE CAPACITY	PROCESS VESSELS CAPACITY
PUREX	150	100	215
B Plant	10	0	#225
S Plant	2	9	0
T Plant	17	50	0
100 Area	0	50	0
300 Area	7	60	0
400 Area	10	23	0
PFP	2	16	0
TOTAL=	198	308	440

25 Kgal capacity for storage of waste, the remaining space is not routed for storage (Killoy, 1992).

6.0 SPACE SAVING ALTERNATIVES

In the near term, space saving alternatives include waste minimization, continued availability of the 242-A Evaporator, LERF availability, and the LETF start-up. These alternatives must be considered because new inputs to the system may develop (e.g., unexpected new waste streams or a leaking SST or DST).

Should a tank space shortage develop in the period 1998 through 2015, response to the shortage for the Baseline Case must be in one of three areas. The inflows to the system must be reduced, the outflows to the system must be increased (or started earlier), or the available tank space increased. Inflows to the system include miscellaneous facility waste generations, TCO wastes, in-tank washing, dilution of Tanks 101 and 103-SY (for pretreatment), pretreatment, SWL pumping, and SST solids retrieval. Outflows include the 242-A Evaporator and waste vitrification. Increasing the tank space available could be done by building more tanks (a six to eight year task), mixing segregated waste types (which would gain about half a million gallons of space but increase interim storage and final disposal costs), or operating without reserved spare tank space. A cost/benefit analysis needs to be completed to determine the best alternative.

In addition to minimizing waste generations, other actions could be pursued. The list below includes many actions which can result in tank space savings or economization, and can serve as a starting point in a tank space optimization program.

PUREX Facility

- Continue to reduce waste being generated at the PUREX facility
- Evaporate dilute waste, from the PUREX facility and other facilities, in the PUREX facility concentrator
- Ion exchange of low level waste (outside vendor)
- Reroute non-hazardous streams to chemical sewer for land disposal
- Make the TCO of PUREX dependent upon tank space availability

B Plant

- Continue to reduce waste being generated at B Plant
- Route BCP waste to cribs
- Evaporate dilute waste, from B Plant and other facilities, in B Plant concentrators
- Replace steam heaters with electric heaters
- Make TCO at B Plant dependent on tank space availability

Plutonium Finishing Plant

- Continue to reduce waste being generated at PFP

6.0 SPACE SAVING ALTERNATIVES (CONTINUED)

Tank Farms

- Continue to reduce waste being added to DSTs
- Continue waste accountability and minimization controls
- Develop a total waste cutoff plan
- Increase the 5 M Na limitation on aging waste tanks
- Use dilute waste for retrieval, air lift circulator flushes, line flushes, etc.
- Increase the WVR of the 242-A Evaporator
- Accelerate plans to consolidate solids from Tanks 103-AW, 105-AW, and 102-SY into Tank 103-AW
- Delay SWL pumping
- Build new tanks
- Accept loss of waste segregation (used in an extreme emergency)
- Store facility generated waste in designated "spare tank space" (used in an extreme emergency)
- Improve efficiency of the 242-A Evaporator
- Solidify treated waste and dispose of as low level waste in burial grounds
- Accelerate in-tank washing to allow consolidation of NCAW and Tank 106-C solids in one aging tank with one additional aging tank being used to combine NCAW supernates.
- Increase the heat limit on non-aging DSTs to allow either the Tank 106-C wastes or the supernate from Tank 101-AZ to be stored in a non-aging DSTs if the in-tank washing consolidations are not allowed
- Concentrate DSSF to Double-Shell Slurry (DSS). Experience with Tank 101-SY makes this alternative highly unlikely
- Store DN or DSSF wastes on NCRW solids.

Grout

- Reinstate the Grout Disposal Program
- Grout the existing waste in Tanks 102-AP and 101-AW

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APPENDIX

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APPENDIX. Acronyms

ASD - ammonia scrubber distillate from
ASF - ammonia scrubber feed from
AW - aging waste, also called NCAW
BCP - B Plant process condensate
CC - complexant concentrate waste
CP - concentrated phosphate waste
DC - dilute complexed waste
DCRT - doubly contained receiver tank
DN - dilute non-complexed waste
DOE - U.S. Department of Energy
DP - dilute phosphate waste
DSS - double-shell slurry (most concentrated double-shell tank waste)
DSSF - double-shell slurry feed
DST - double-shell tank
EIS - Environmental Impact Study
FFTF - Fast Flux Test Facility
FSAR - Facility Safety Analysis Report
FY - fiscal year
GTF - Grout Treatment Facility
HFW - Hanford facility waste (waste produced at 100, 300, 400 areas)
HLW - High Level Waste
IPM - Initial Pretreatment Module
IX - ion-exchange
KGAL - kilogallon (1000 gallons)
LERF - Liquid Effluent Retention Facility
LETF - Liquid Effluent Treatment Facility
LLW - Low Level Waste
MTU - metric tons of uranium
NCAW - neutralized current acid waste
NCRW - neutralized coating (cladding) removal waste
(synonym: cladding removal waste)
OWVP - Operational Waste Volume Projection
NEPA - National Environmental Policy Act
NPF - New Pretreatment Facility
NPV - New Pretreatment Vault
PDD - process distillate discharge from PUREX
PFP - Plutonium Finishing Plant
PRF - Plutonium Reclamation Facility
PSW - phosphate/sulfate waste
PUREX - Plutonium-Uranium Extraction
PWR II- pressurized water reactor, Shippingport Core II
RMC - Remote Mechanical C Line
SpG - Specific Gravity
SST - single-shell tank
SWL - salt well liquid
TCO - terminal clean-out
TOE - total operating efficiency
TPA - Tri-Party Agreement
TRU - transuranic
TRUEX - Transuranic Extraction Process
TSMB - Tank Space Management Board
UO_3 - Uranium Oxide Facility
WSCF - Waste Sampling and Characterization Facility
WVR - waste volume reduction

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