PBS-SR-0014

Radioactive Liquid Tank Waste Stabilization and Disposition

Risk and Opportunity Management Plan

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Savannah River Remediation
AECOM | BECHTEL | CH2M | B&W | AREVA

Savannah River Site
Aiken, SC 29808

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REVISION SUMMARY

Rev. No.	Rev. Date	Affected Sections	Description of Revision
0A	6/12/2006	All	Initial issue for format approval
0B	6/15/2006	All	In-process issue for consistency check
0C	6/21/2006	All	In-process draft for information
0D	6/22/2006	All	In-process draft for information
0E	6/28/2006	All	In-process comment resolution draft
0	6/30/2006	All	Initial issue
1	7/19/06	Pages 47, 213 and 214.	Updated information on Risk 119, corrected typos in Table 11. All changes indicated with revision bars
2	7/24/07	All	General revision to update risk data and analysis. No revision bars used.
3	8/14/07	Acronym List, Table 4, Figure 3, text page 11, text page 33, Appendix C and Appendix D	Performed administrative changes ensure consistency with all PBSs: utilized new ROAF format; added WBS reference to ROAFs; added further clarification to risk consequence thresholds; aligned Severe and Very Severe terms with Critical and Crisis; modified residual risk grading to use worst case in lieu of most likely; statused crosscutting risks as superseded; removed T&PRA analysis results and referred to SRS contingency analysis. Corrected typo in Table 4.

			Added listing of risks making major contributions to contingency as identified in SRS contingency analysis. All changes denoted by revision bars.
4	8/26/08	General Revision	Annual Update – Revised all risk data, updated completion status of risk handling strategies and riskometer to establish risk management baseline for FY08-09. New site risk categories applied. No revision bars used.
5	1/7/10	General Revision	Annual Update – Revised all risk data, updated completion status of risk handling strategies and riskometer to establish risk management baseline for FY09-10. Added new sections on near-term risk management, contingency analysis and opportometer. Incorporated DOE review comments. No revision bars used.
6	6/25/10	Interim Revision	Interim Revision to support CPB development. Revised risk data, write up and contingency calculation as required to execute IRL entry disposition. Expanded section 5.6 to include MR and Contingency methodology and results, added Appendix F to show contribution of Control Accounts to MR and Contingency. Revision bars indicate changes.
7	12/15/10	General Revision	Annual Update – Revised all risk data, updated completion status of risk handling strategies and riskometer to establish risk management baseline for FY10-11. No revision bars used.
8	3/14/12	General Revision	Annual Update – Revised all risk data, updated completion status of risk handling strategies and riskometer to establish risk management baseline for FY11-12. No revision bars used.

9	6/18/13	General Revision	Annual Update – Revised all risk data, updated completion status of risk handling strategies and riskometer to establish risk management baseline for FY13-14. No revision bars used.
10	7/1/14	General Revision	Annual Update – Revised all risk data, updated completion status of risk handling strategies and riskometer to establish risk management baseline for FY14-15. No revision bars used.
11	4/14/16	General Revision	Annual Update – Revised all risk data, updated completion status of risk handling strategies and riskometer to establish risk management baseline for FY16-17. No revision bars used.

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LIST OF ACRONYMS

ALARA – As Low As Reasonably Achievable

ARP – Actinide Removal Process

BC – Best Case

BWRE – Bulk Waste Removal

CL – Confidence Level

CMB – Contract Management Baseline

CPB – Contract Performance Baseline

CSF – Canister Shipping Facility

CSSX – Caustic Side Solvent Extraction

D&D – Decontamination and Decommissioning

DDA – Deliquification, Dissolution and Adjustment

DIRT – Data Integrity Review Team

DNFSB – Defense Nuclear Facilities Safety Board

DOE – Department of Energy

DOE-SR – Department of Energy, Savannah River Operations Office

DSA – Documented Safety Analysis

DSS – Decontaminated Salt Solution

DWPF – Defense Waste Processing Facility

ELAWD – Enhanced Low Activity Waste Disposal

EPC – Engineering, Procurement, and Construction

EM – Environmental Management

ESS – Essential Site Services

ETF – Effluent Treatment Facility

FESV – Failed Equipment Storage Vault

FFA – Federal Facility Agreement

FIT – Filter improvement Team

FSA – Functional Service Agreement

FTF – F-Area Tank Farm

GP – General Purpose

GWSB – Glass Waste Storage Building

GWSP – Glass Waste Storage Project

HLW – High Level Waste

HSS – Health, Safety and Security

HTF – H-Area Tank Farm

iACT – i Accelerate the Closure of Tanks

IAL – Inter-Area Transfer Line

ICD – Interface Control Document

IPT – Integrated Project Team

IRL – Interim Risk Log

IW – Inhibited Water

LLW – Low Level Waste

LTAD – Low Temperature Aluminum Dissolution

LW – Liquid Waste

LWTR – Liquid Waste Tank Residual

M&O – Maintenance and Operations (contract)

MEP – Maximum Extent Practical

MCU – Modular Caustic Side Solvent Extraction Unit

MLC – Most Likely Case

MOX – Mixed Oxide (Fuel Fabrication Facility)

MR – Management Reserve

MST – Monosodium Titanate

NAS – Sodium Aluminum Silicate

NGS – Next Generation Solvent

NNSA – National Nuclear Security Administration

NPH – Natural Phenomena Hazard

NRC – Nuclear Regulatory Commission

NTB – Near Term Baseline

OA – Oxalic Acid

OHS – Opportunity Handling Strategy

OPER – Out-Year Planning Estimate Range

ORPS – Occurrence Reporting and Processing System

PA – Performance Assessment

PBS – Project Baseline Summary

PEP – Program Execution Plan

PISA – Potential Inadequacy in the Safety Analysis

PSHA – Preliminary Safety Hazards Analysis

QAPP – Quality Assurance Program Plan

RCT – Recycle Collection Tank

R&D – Research and Development

RIE – Rapid Improvement Event

R&O – Risk and Opportunity

ROAF – Risk and Opportunity Assessment Form

ROAR – Risk and Opportunity Analysis Report

ROMP – Risk and Opportunity Management Plan

RHS – Risk Handling Strategy

RMB – Risk Management Board

SA – Special Analysis

SAPP – Sampling Assurance Program Plan

SAR – Sample Analysis Report

SCDHEC – South Carolina Department of Health and Environmental Control

SCT – Shielded Canister Transporter

SDF – Saltstone Disposal Facility

SDI – Salt Disposition Integration

SDU – Saltstone Disposal Unit

SE – Strip Effluent

SEFT – Strip Effluent Feed Tank

SEHT – Strip Effluent Hold Tank

SFF – Saltstone Feed Facility

SLA – Service Level Agreement

SMW – Slurry Mix Evaporator

SNM – Special Nuclear Material

SOL – Sludge Oxide Loading

SPD – Salt Processing Division

SPF – Saltstone Processing Facility

SPP – Salt Processing Program

SRAT – Sludge Receipt and Adjustment Tank

SRE – Sodium Reactor Experiment

SRNL – Savannah River National Laboratory

SRR – Savannah River Remediation LLC

SRS – Savannah River Site

SRNS – Savannah River Nuclear Solutions

SSCs – Systems, Structures and Components

SSRT – Salt Solution Receipt Tank

STAR – Site Tracking Analysis Reporting (System)

STP – Site Treatment Plan

SWPF – Salt Waste Processing Facility

TCCR – Tank Closure Cesium Removal

TCLP – Toxicity Characteristic Leaching Procedure

T&PRA – Technical and Programmatic Risk Assessment

TSR – Technical Safety Requirement

WAC – Waste Acceptance Criteria

WBS – Work Breakdown Structure

WC – Worst Case

WCP – Waste Compliance Plan

WCS – Waste Characterization System

WD – Waste Determination (National Defense Authorization Act Section 3116)

WIR – Waste Incidental to Reprocessing

WSDP – Waste Stabilization and Disposition Program

EXECUTIVE SUMMARY

This Risk and Opportunity Management Plan (ROMP) describes the systematic process used for assessing and managing risks for the Radioactive Liquid Tank Waste Stabilization and Disposition Program, PBS-SR-0014, and presents the summary of Management Reserve and Contingency for PBS-SR-0014.

The Savannah River Site (SRS) is a Department of Energy (DOE) site which has produced nuclear materials for national defense, research, and medical programs since it became operational in 1953. The F-Area and H-Area Tank Farms were constructed to receive the waste generated from the production and processing of nuclear materials and the SRS laboratory facilities. Over time, the F-Area and H-Area Tank Farms have received over 150 million gallons of waste from 1954 to the present for storage and treatment in fifty-one (51) high-level waste underground storage tanks. The tank farm facilities are in place to pretreat the accumulated sludge and salt solutions (supernate) to enable management and treatment of the waste within other SRS facilities such as the Defense Waste Processing Facility (DWPF) and Saltstone Production Facility (SPF). The pretreatment facilities convert the sludge and salt solution to more stable forms suitable for permanent disposal in a Federal Repository or the Saltstone Disposal Facility, as appropriate. To date the volume of the waste received has been reduced via evaporation and disposition via vitrification and saltstone, such that currently, there are approximately 36 million gallons of waste containing approximately 250 million curies of radioactivity stored in the remaining forty-three (43) of these underground waste storage tanks. Seven tanks have been operationally closed (e.g. stabilized with grout) as authorized by regulatory approval and one is currently being filled with grout. Continued, long-term storage of these wastes in underground tanks poses a potential environmental risk. Twenty-four of these tanks, those which do not have a full secondary containment, are referred to as “old-style” designed tanks. Fourteen (14) of these old-style tanks are known to have leak sites in the primary tank wall. Beginning in 1996, the LW Program has been removing the higher activity sludge waste from tanks, vitrifying it, and pouring the vitrified waste into canisters, which are stored, pending disposition in a federal repository. Beginning in 2007, the salt component of the waste has been treated, first with the DDA process and, beginning in 2008, with the Actinide Removal Process/Modular Caustic Side Solvent Extraction (ARP/MCU) process. This allows the disposition of the higher activity portion of the salt waste with sludge vitrification while dispositioning the low level portion in the Saltstone Disposal Facility (SDF). As a result of this waste removal, of the 14 tanks with leakage history:

- 5 are operationally closed and grouted (Tanks 5, 6, 16, 19 and 20) (Note Tanks 17 and 18 are also grouted, but did not have a leakage history)
- 1 is in process of being grouted (Tank 12)
- 1 is being prepared for waste removal (Tank 15)

- 4 contain essentially dry waste, with little or no free liquid supernate (Tanks 1, 9 and 14)
- 3 contain liquid supernate at a level below all known leak sites (Tanks 4, 10, 11 and 13).

Of the remaining 10 old-style tanks (none of which have any known leakage history):

- 2 are operationally closed and grouted (Tanks 17 and 18))
- 2 contain essentially dry waste with little or no free liquid supernate (Tanks 2 and 3)
- 6 contain liquid supernate (Tanks 7, 8, and 21 through 24)

As of December 31, 2015, 4,000 canisters of waste had been vitrified. This represents approximately 49% of the total projected 8,170 canisters. Canister waste loading has been raised from the originally planned ~28% to the current waste loading of ~36% and is planned to be further raised up to ~40%.

Approximately 65% of the old-style tank nominal storage space is currently unused or closed.

Data shown in Table ES1 indicate that approximately 40 million gallons of usable space have been created over the last eight years from (1) evaporator operations, (2) DWPF vitrification, (3) ARP/MCU Treatment; and (4) saltstone disposal. This valuable space has been used to (1) remove waste from and clean old-style tanks, (2) prepare, qualify, and treat sludge waste for disposal, (3) prepare, qualify, treat, and dispose salt waste, and (4) support nuclear materials stabilization and disposal through H-Canyon.

Table ES1 – Gallons (in 1000s) of Usable Tank Space Recovered

	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	Total
Evaporator Operations	1,908	2,349	3,120	3,212	2,481	2,322	2,115	1,346	2,711	**21,564**
DWPF Vitrification	169	280	227	220	342	352	168	150	131	**2,040**
ARP/MCU Treatment	N/A	142	556	287	1,065	705	1,320	551	753	**5,379**
Saltstone Disposal	244	1,343	1,526	1,014	1,487	1,251	2,005	1167	828	**10,865**
Total	**2,322**	**4,113**	**5,429**	**4,733**	**5,374**	**4,630**	**5,609**	**3,214**	**4,423**	**39,848**

Completion of the PBS-SR-0014 scope will result in the treatment and preparation for permanent disposal of the liquid radioactive waste currently stored at the SRS as well as radioactive waste from planned nuclear materials stabilization activities and the final closure of the remaining 45 underground storage tanks by FY2041. Completion will also include the decommissioning of the major facilities and equipment which comprise the LW System. Once facilities are decommissioned, these facilities will be transferred to PBS-SR-0030 for final closure.

This PBS-SR-0014 Risk and Opportunity Management Plan (ROMP) documents the identification and analysis of risks and opportunities for PBS-SR-0014 relative to System Plan Revision 20 (Reference 9) and is a revision to the previous PBS-SR-0014 ROMP (Reference 1) which documented the identification and analysis of risks and opportunities for PBS-SR-0014 relative to System Plan Revision 19 (Reference 8).

To develop the PBS-SR-0014 annual update, a core team of contractor and DOE-Savannah River managers and subject matter experts were used to review and update the entire body of knowledge pertaining to PBS-SR-0014 risk. After validating the assessable element structure to represent the full PBS-SR-0014 scope to completion, the team reviewed existing risks, risk register items and then performed further brainstorming to identify new risks and opportunities. The risks were formally evaluated, categorized, grouped and validated. Risk handling strategies were developed and residual risks defined. For this revision selected subject matter experts and appropriate risk owners were utilized.

Successful execution of the individual projects/operations activities and completion of PBS-SR-0014 requires the reduction of risk levels to their residual levels by the funding and aggressive execution of identified risk handling strategies. In accordance with the overall DOE philosophy of "Solving Cleanup Challenges Through Risk Reduction," reductions in risk level depend on successful implementation of the identified risk handling strategies. The residual high risks for PBS-SR-0014 relate to:

- Risk 027 – Being able to adequately fund PBS-SR-0014 throughout its life cycle to permit full execution of the System Plan is uncertain. This risk is a crosscutting risk for both major contractors at SRS and will be handled at the site level.
- Risks 011, 204 and 295 – The System Plan end date places significant stress on what will be an increasingly aging infrastructure. Recent infrastructure failures provide an insight into the problems that may be encountered with operating the HLW System for an additional 24 years.
- Risk 090 – The capacity of the existing Tank Farm infrastructure will be stretched close to its limits in supporting salt batch preparation. Choke points could easily be encountered if multiple use conflicts develop and planned availability of transfer routes and equipment are impacted.
- Risk 472 – Imposing controls on operations projects/activities similar to those required for congressional line item/capital asset projects results in significantly

extending project/activity durations, increasing overall cost and impacting System Plan execution.

Timely SWPF startup remains a key element of successful Program execution. The risks associated specifically with the SWPF Project are being managed external to this ROMP. However, a significant delay in SWPF startup would be of severe impact to the Program forcing almost an equal duration delay to the completion of PBS-SR-0014.

Continuing active management and mitigation of risk is proving essential in limiting risk exposure within PBS-SR-0014 and remains an essential factor in minimizing the adverse impacts of uncertainties to the program.

A comparison of near-term T&PRA based contingency contributions for System Plan Revisions 19 and 20 execution shows an increase in the overall SRR risk-based T&PRA contingency contribution ($59M to $99M), and a significant reduction in the DOE near-term contingency (from $337M to $28M). The increase in SRR risk-based T&PRA contingency contribution can be attributed to the addition of new emergent risks to the risk register and also the re-aligning of near-term to a five year window. The reduction in DOE near-term contingency can be attributed to closing two major risks that were not realized and developing a successful strategy to avoid the impacts of a site utility outage:

- Waste Determination (WD) Approval Does not Support System Plan (266)-Closed
- Seismic Response Spectra Acceleration Values Increase (407)-Closed
- Site utility Outage-Avoided

A significant increase in outyear contingency was noted, from $4,032M to $8,453M. A comparison between System Plan Revisions in Table 11 shows changes in outyear contingency for the last five System Plan revisions relative to Program completion date. The significant increase between Revision 19 and Revision 20 System Plan OPER Contingency can be attributed to:

- Addition of a significant number of emergent risks (Refer to Section 5.2)
- Recent infrastructure failures which resulted in elevating the likelihood of existing equipment and infrastructure failure risks.
- Closure of a significant number of opportunities (Refer to Section 5.2)
- Integration of salt and sludge processing, which reduces the number of canisters, yet increases the impact of a sludge feed break which no longer is mitigated by using simulant.

Table ES2 – Comparison of System Plan Execution Revisions 15 through 20

System Plan	End Date	Outyear T&PRA Contingency ($M)
Revision 15	FY2032	2,802
Revision 16	FY2026	4,942
Revision 17	FY2028	1,875
Revision 18	FY2033	2,695
Revision 19	FY2042	4,032
Revision 20	FY2041	8,453

SRR will manage this execution strategy by implementing the risk handling strategies identified within this ROMP and by focusing attention on continuous development of innovative handling strategies and facilitating benefits from identified opportunities.

To ensure continuing active management and full implementation of risk and opportunity handling strategies, an action item list has been prepared as an integral part of the electronic risk register. This list identifies the individuals and organizations responsible for implementing handling strategies and will be used by management to monitor the execution progress. Action items will be entered into the Site Tracking, Analysis and Reporting (STAR) system and electronically tracked to completion. A tool known as a "riskometer" is also part of the integrated risk management process and has been developed as a management status tool to provide a condensed "snap shot" of risk management status at any point in time. A similar tool is used to status the management of opportunities.

A joint DOE-SRR Risk Management Board performs periodic reviews of the status of action items due in the near-term work window, the riskometer for selected risks and the Interim Risk Log for new emergent risks and changes to existing risks. These reviews allow senior management to highlight and direct focus and resources to changing risk priorities.

1.0 INTRODUCTION

SRS was constructed during the early 1950s to produce basic materials such as plutonium and tritium used for nuclear weapons production. The site covers approximately 310 square miles in South Carolina and borders the Savannah River. Chemical and radioactive wastes are by-products of nuclear material production processes. These wastes are treated, stored and, in some cases, disposed at SRS. The primary DOE programs at SRS are the Environmental Management (EM) and the National Nuclear Safety Administration (NNSA) Programs. The DOE EM Program work has been organized into Program Baseline Summaries (PBSs). The management principles contained in DOE P 413.1, DOE O 413.3B, DOE G 413.3-7A, (References 2, 3, and 4) are applied to the Program as appropriate.

This ROMP has been developed to define risk management requirements and outline their implementation for PBS-SR-0014, Radioactive Liquid Tank Waste Stabilization and Disposition. Risk management will be performed jointly with appropriate oversight by DOE-SR and contractor management. The purpose of utilizing the Risk and Opportunity (R&O) management process is to increase the overall effectiveness of the EM work associated with this program so risks are managed to acceptable levels and opportunities can be realized to enhance PBS scope completion.

2.0 SCOPE OF THE PBS RISK AND OPPORTUNITY ASSESSMENT

2.1 PROGRAM BACKGROUND

The Savannah River Site (SRS) is a Department of Energy (DOE) site which has produced nuclear materials for national defense, research, and medical programs since it became operational in 1953. The F-Area and H-Area Tank Farms were constructed to receive the waste generated from the production and processing of nuclear materials and the SRS laboratory facilities. Over time, the F-Area and H-Area Tank Farms have received over 150 million gallons of waste from 1954 to the present for storage and treatment in fifty-one (51) high-level waste underground storage tanks. The tank farm facilities are in place to pretreat the accumulated sludge and salt solutions (supernate) to enable management and treatment of the waste within other SRS facilities such as the Defense Waste Processing Facility (DWPF) and Saltstone Production Facility (SPF). The pretreatment facilities convert the sludge and salt solution to more stable forms suitable for permanent disposal in a Federal Repository or the Saltstone Disposal Facility, as appropriate. To date the volume of the waste received has been reduced via evaporation and disposition via vitrification and saltstone, such that currently, there are approximately 36 million gallons of waste containing approximately 250 million curies of radioactivity stored in the remaining forty-three (43) of these underground waste storage tanks. Seven tanks have been operationally closed (e.g. stabilized with grout) as authorized by regulatory approval and one tank is currently being filled with grout. Continued, long-term storage of these wastes in underground tanks poses a potential environmental risk. Twenty-four of these tanks, those which do not have a full secondary

containment, are referred to as "old-style" designed tanks. Fourteen (14) of these old-style tanks are known to have leak sites in the primary tank wall. Beginning in 1996, the LW Program has been removing the higher activity sludge waste from tanks, vitrifying it, and pouring the vitrified waste into canisters, which are stored, pending disposition in a federal repository. Beginning in 2007, the salt component of the waste has been treated, first with the DDA process and, beginning in 2008, with the ARP/MCU process. This allows the disposition of the higher activity portion of the salt waste with sludge vitrification while dispositioning the low level portion in SDF. As a result of this waste removal, of the 14 old-style tanks with leakage history:

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Completion of the PBS-SR-0014 scope will result in the treatment and preparation for permanent disposal of the liquid radioactive waste currently stored at the SRS as well as radioactive waste from planned nuclear materials stabilization activities and the final closure of the remaining 45 underground storage tanks by FY2041. Completion will also include the decommissioning of the major facilities and equipment which comprise the LW System. Once facilities are decommissioned, these facilities will be transferred to PBS-SR-0030 for final closure.

2.2 PROGRAM SCOPE

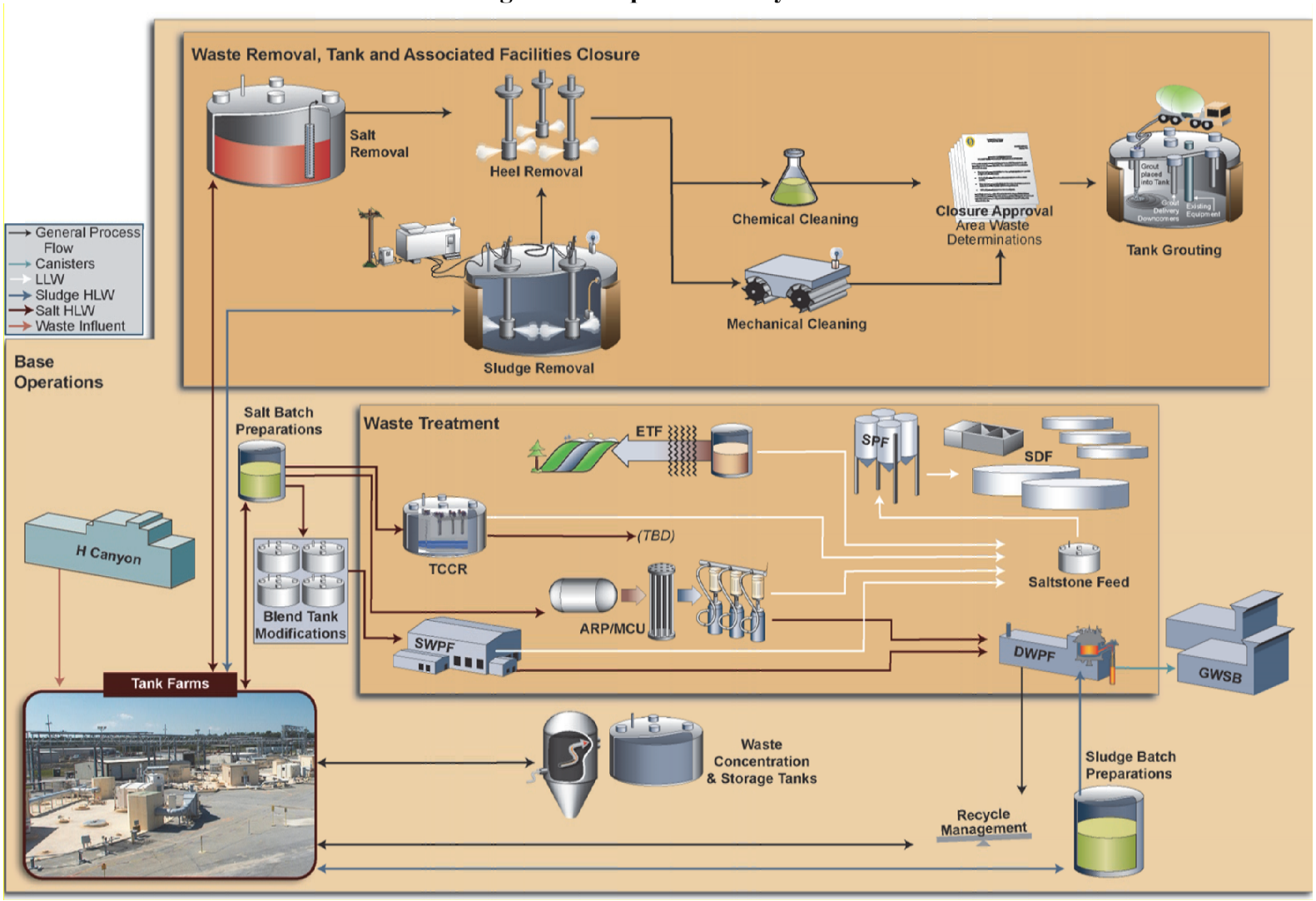
The scope of this Program is the stabilization and disposition of approximately 36 million gallons of LW stored in 43 underground storage tanks, as well as future waste from planned nuclear materials stabilization activities. It includes the management of waste in the F and H Tank Farms through transfers, evaporation, and storage to effectively manage tank space. The high level waste (HLW) fraction of the removed waste will be processed into borosilicate glass canisters at DWPF and temporarily stored onsite until a Federal Repository is available. Two Glass Waste Storage Buildings (GWSBs) are now in use to store the glass canisters and additional storage capacity is planned to provide temporary storage of all canisters produced.

SWPF is being designed and constructed as a DOE-SR Line Item Project and will be operated for approximately one year before being transitioned to LW Operations for the remainder of its operational life. SWPF will pre-treat salt waste, resulting in the highly radioactive fraction being sent to DWPF for vitrification. Additional capacity to pre-treat salt waste is being provided prior to SWPF startup by ARP/MCU. The low-level waste products from these pre-treatment processes are being treated and disposed of in a grout-based form at SDF.

Deactivation of LW facilities and tanks is included in this Program. All LW tanks in H and F Tank Farms will be operationally closed (e.g. removed from service and filled with grout). The 1H, 1F, 2H, 2F, and 3H Evaporators and contaminated waste transfer systems will be operationally closed, as appropriate. All other facilities will be deactivated with approved deactivation plans before turnover to PBS-SR-0030.

Figure 1 shows the Liquid Waste System.

Figure 1 – Liquid Waste System



2.3 PROGRAM ASSUMPTIONS

Assumptions for the implementation of PBS-SR-0014 are documented in the System Plan (Reference 9). Key assumptions associated with the implementation of PBS-SR-0014 are shown in Table 1.

Table 1 – Assumptions

Assumption Number	Assumption
	Funding

1	• Funding profile to be used is as follows:
	  o $446M in FY16
	  o $475M in FY17
	  o $490M in FY18
	  o $500M in FY19
	  o $520M in FY20
	  o $525M/yr beginning in FY2 l. and escalated 1% thereafter, until the end of the Program
	• Beginning in FY19, an additional $80M per year in operating funds is available for SWPF operations
	• Includes Line Item funding, including assigned contingency, for Saltstone Disposal Units (SDUs) beginning with SDU-7
	• Includes Line Item funding, including assigned contingency, for a Glass Waste Storage Project (GWSP)
	• The following items are not included in the LW contractor funding and will be funded separately: SWPF (project and operation through end of FY21), Landlord services, Essential Site Services (ESS - Section J), DOE Managed, and pension and legacy cost (e.g., Section J and SLAs)
	• No “re-pricing” for site services is realized.

	Salt Processing

2	ARP/MCU:
	• No major modifications to ARP/MCU will be implemented to increase processing capacity to over 3 million gallons per year. Modifications that may be made include upgrading ARP/MCU facilities as required to maintain the operating rate for the extended life
	• ARP/MCU facilities operate to ensure the total Interim Salt Treatment curies emplaced in SPF are within the amount identified in *Savannah River Site – Liquid Waste Disposition Processing Strategy* (SRS LW Strategy), as amended by letter from the South Carolina Department of Health and Environmental Control (SCDHEC) to DOE-SR and the *Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site.*
	• A seven-month outage in FY18 is planned, coincident with a DWPF melter change-out. This outage will allow for ARP/MCU facility upgrades, which may include contactor bearings, weir adjustment, etc.
	• Nominally ARP/MCU will produce:
	  o For each gallon processed, ~1.2 gal of DSS for SPF
	  o For each gallon processed, ~0.08 gal of SE for DWPF
	  o For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF

3	SWPF: • SWPF becomes operational December 3, 2018 • Required Tank Farms, DWPF, and SPF Modifications (e.g., SWPF Integration) for SWPF, through Readiness Assessment (RA), will be complete two months prior to the initiation of the SWPF Operational Readiness Review (ORR)

4	The SWPF nominal capacity is:
	• 4.625 Mgal for the first year of operation
	• 7.2 Mgal/yr for the next two years of operation
	• An SWPF outage is assumed at an appropriate time after SWPF first year of operation to perform next generation solvent implementation to increase facility capacity to 9.0 million gallons per year
	• Nominally SWPF will produce:
	  o For each gallon processed, ~1.28 gal of DSS for SPF
	  o For each gallon processed, ~0.08 gal of SE for DWPF
	  o For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF
	Note: when production exceeds 7.2 Mgal/yr, SE will be limited to 576 kgal/yr

5	SWPF feed chemistry is per SWPF Feed Specification Radionuclide Limits of the SWPF *Waste Acceptance Criteria* including:
	• The initial one million gallons of feed to SWPF will be (at 6.44 M Na):
	  o ≤ 1.0 Curies per gallon (Ci/gal)
	• All batches are planned to be at 6.44 M Na
	• Additional blending may be required to meet other feed criteria, such as:
	  o OH > 2 M
	  ▪ Caustic (50% NaOH) additions are planned during salt dissolution and batch preparation, as needed to meet the minimum 2 M OH requirements
	  o Al < 0.25 M
	  o Si < 842 mg/L

	Sludge Processing
6	DWPF canisters will maintain a concentration limit of 897 g/m^3 of fissile material in the glass. Sludge batch preparation will supply feed for the DWPF to ensure the canisters remain within this requirement.
7	The canister heat load will be less than 834 watts per canister.
8	The current washing plan assumes washing to 1.25 M Na.
9	Pu discards from H-Canyon will be supported to the extent allowable without negatively impacting planned canister waste loadings while continuing to comply with the canister fissile material concentration limits.
	DWPF Operations
10	An operational spare melter is to be available when a melter is replaced to mitigate the risk associated with "infant mortality."
11	A six-month DWPF outage, beginning July 2017, is required for SWPF tie-ins immediately prior to SWPF becoming operational. During this outage DWPF plans to implement productivity enhancements to support increased influents from SWPF. Note that this outage is coincident with the four-month melter outage.
12	Melter #2 replacement in a four-month outage in FY17, coincident with an MCU contactor outage. In the event of a melter replacement outage before FY17, ARP/MCU will enter a forced outage and an evaluation will be performed to determine the prudence of initiating premature contactor bearing replacement. Performing replacement of Melter #2 during this outage will require DOE concurrence.

13	Four-month melter replacement outage every 96 months (eight years) continues through the life of the program (i.e., 92 months of operations with four months of outage every 96 months). Even though replacement is assumed in this Plan every 96 months, actual replacement will be done upon failure of the Melter.
14	DWPF recycle is beneficially reused.
15	GWSB #1 will be converted to allow stacking two canisters in each currently available storage position and additional canister storage capacity will be available, as necessary, after the GWSB #2 and the stacked GWSB #1 are filled.
16	Shipment of canisters off-site for final disposition is not in the scope of the LW System Plan.
	SPF and SDF Operations
17	During ARP/MCU operations: • May require operation of more than one cell and the use of "cold caps" to meet radiological control requirements
18	During SWPF operation: • SPF and SDF will support SWPF processing rates • Additional operational time (i.e., multiple shifts, additional operating days each week, etc.) and adequate SDU receipt space to match production streams from SWPF are planned • Modifications will provide sufficient contingency storage capacity to minimize impacts to SWPF or ETF due to SPF or SDF outages
19	Since neither ARP/MCU nor SWPF process during melter replacement outages, SPF is not planned to operate other than to run off any backlog material that may be in the feed tanks.

20	Two SDUs, SDU-3, and SDU-5 are in service. Neither Vault 1 or Vault 4 or the filled SDU 2, are planned to receive additional saltstone grout: ● Each gallon of DSS feed, when added to the cement, flyash, and slag, makes 1.76 gallons of grout ● SDU-3, and SDU-5 have two 150-foot diameter by 20-foot tall disposal cells. Each cell will contain ~2,300 kgal of grout. Therefore, each cell holds ~1,290 kgal of Tank 50-material feed solution; each SDU holds ~ 2,580 kgal of Tank 50-material feed solution ● SDU-6–SDU-13 will be a single 375-foot diameter by 43-foot tall disposal cell which can contain 32 Mgal of grout. With the cold cap it will have a capacity of 30 Mgal of contaminated grout or 17.1 Mgal of Tank 50-material feed solution.
	Effluent Treatment Facility (ETF)
21	ETF is assumed to receive an average of 11 Mgal/yr: • LW Evaporators: 5 Mgal/yr • Savannah River Nuclear Solutions (SRNS) Facilities: 6 Mgal/yr Note: the Agreement between SRNS and SRR for LW Receipt Services provides that the total maximum allocation for waste generated from SRNS facilities including H-Canyon, F-Canyon, the Waste Solidification Building, Mixed Oxide Facility, and miscellaneous smaller contributors is 15 Mgal/yr.
	Tank Removal from Service
22	Types I, II, and IV tanks (Tanks 1–24): • Waste Removal and Tank Removal from Service commitments are per the FFA o Types I, II, and IV tanks (including Tanks 4, 7, 8, 11, and 21 through 24) may be used to optimize output of the Plan
23	Type III and IIIA (Tanks 25–51): • While the Type III and IIIA tanks are not included in the FFA, commitment for completion of waste removal (bulk waste and heel) from all tanks is per the STP • Tanks are not required to be isolated and grouted to meet the STP
24	Waste removal and cleaning activities could include mechanical, chemical, and water washing operations.

25	Two Phases of Waste Heel Removal are available for use:
	• Mechanical Cleaning uses mechanical agitation
	  o Assumed to take three months of operation unless otherwise stated
	  o Heel solids volume reduced to less than 5 kgal
	• If needed, Chemical Cleaning uses LTAD, OA or advanced/specialized mechanical or chemical technology
	  o Assumed to take three months of operation unless otherwise stated
	• For some tanks with high waste turnover, e.g. Tank 8, mechanical cleaning may not be required; however, flushing could be required prior to chemical cleaning
	• This Plan assumes Tanks 4, 7, 8, 11, 13, 14, 15, 26, 32, 33, 34, 35, 39, 42, 43, 47 are the sludge tanks that have chemical cleaning. No other tanks are planned for chemical cleaning. These tanks will be sampled and analyzed after BWRE complete to determine the amount of chemical cleaning necessary
	• Monitoring during heel removal will inform the decision to do mechanical or chemical cleaning.

26	All tanks that have experienced leaks will undergo inspection and, potentially, sampling and analysis to determine the necessity for annulus cleaning. The amount of material used for annulus cleaning depends on the extent of waste present.
27	A 30-month operational closure and stabilization process is assumed • Drying & Sampling (6 months on critical path): including Tank Drying, Sample Prep Documents, Volume Determination Cessation Presentation and Sampling • Sample Analysis (7 months on critical path): including Lab Analysis and Sample Analysis Report (SAR) • Closure Documentation (14 months on critical path): including DQA, Inventory Determination, Special Analysis, MEP, Class C Calculation, Closure Module, and Tier 2 • Grouting (3 months on critical path)
28	SRNL infrastructure will be enhanced or additional labs will be qualified to enable the receipt, analysis, and report for as many tanks as needed.

29	Overall tank closure priority will support area closure in the following order, as feasible: 1. F-Tank Farm 2. H-Tank Farm West Hill 3. H-Tank Farm East Hill
	Tank Farm Operations
30	Sufficient tank space volume is available to support the projected receipt of HLW into Tank 39 from H-Canyon operations through FY25. LLW waste, mainly from the General Purpose (GP) Evaporator, dispositioned in SPF are received into Tank 50 and direct discards of Pu and neptunium materials to the DWPF feed system are received into Tank 40, or Tank 51.
31	Tank Farm feed preparation infrastructure modifications required to support SWPF processing rates including: • H-Tank Farm Blend tanks readiness for salt solution preparation • F-Tank Farm Blend tanks readiness for salt solution preparation • Tank 49 readiness as SWPF feed tank • Mixing capabilities • Enhanced transfer capabilities • Transfer routes provided to feed tank.
32	The 2H Evaporator System is used to evaporate DWPF recycle. The 3H Evaporator is used to process streams that minimize scale production, i.e., canyon wastes and sludge batch decants. The evaporator system feed and concentrate receipt tanks configuration is: • 3H: Feed – Tank 32; Receipt – Tanks 30 and Tank 37 • 2H: Feed – Tank 43; Receipt – Tank 38.
	Dismantlement and Decommissioning
33	LW Areas transferred to D&D on an Area-by-Area basis upon closure of their included facilities.

2.4 ASSESSMENT SCOPE

The requirements and guidance used in planning and executing this program-level risk assessment comply with DOE Order 413.3B, Program and Project Management for the Acquisition of Capital Assets (Reference 3). Individual project/operations activity risk management activities will be performed consistent with SRS procedures, guidelines and practices referenced below:

- DOE G 413.3-7A, Risk Management Guide (Reference 4)
- Manual E7, Conduct of Engineering and Technical Support, Procedure 2.05A (Reference 5);
- Systems Engineering Guidance Manual - Appendix B: Risk and Opportunity Analysis and Management (Reference 7).
- SRR Manual S14, SRR Business Management, Procedure 1.12 (Reference 11)

This ROMP addresses PBS-SR-0014 risks and opportunities through completion of the program. The current strategy for Salt/Sludge Processing and LW system closure from now until the end of the program is documented in the System Plan (Reference 9).

This ROMP documents the assessment of risks and opportunities associated with implementation of the System Plan. Risks and RHSs identified, analyzed and documented in this plan will be reviewed on an annual basis or more frequently as warranted by major changes to the scope associated with PBS-SR-0014. This plan supersedes the previous PBS-SR-0014 Risk and Opportunity Management Plan (Reference 1). The purpose of this ROMP revision is to establish a risk management baseline for FY 2015-2016, in support of the System Plan Revision 20 (Reference 9), which will facilitate efficient and effective risk management of PBS-SR-0014 and provide an input in the form of an approved risk register and T&PRA risk-based cost contingency data, which is one of the elements used to calculate overall contingencies in development of the SRR CPB.

2.5 MAJOR UPDATES SINCE LAST ASSESSMENT

During the course of the year since the last update, the IRL (Appendix B) was used to identify potential new risks, opportunities, uncertainties and items requiring evaluation with respect to the PBS-SR-0014 risk profile. In addition to these items identified as part of ongoing risk management, several significant changes have been made to the PBS-SR-0014 life cycle baseline in Revision 20 of the System Plan. The major System Plan changes include:

Salt Processing: SWPF Startup: SWPF start-up was further postponed to December 2018. This date change is relative to the previous May 2014 System Plan, (Reference 8).

Sludge Processing: The canister rate was coupled to the salt processing rate as opposed

to operating at a constant nominal rate with the objective of pouring the minimum number of canisters to support salt processing rates. The use of sludge simulent is now no longer planned towards the end of the Program

2.6 RISK MANAGEMENT PROGRESS

Although the PBS completion date has been brought from 2042 to 2041 the potential for equipment and infrastructure failures remains a high risk. However, risk handling strategies have been developed and are being implemented to mitigate this risk exposure and limit the liability for the outyears. Continuing active management and mitigation of risk is proving essential in limiting risk exposure within PBS-SR-0014 and remains an essential factor in minimizing the adverse impacts of uncertainties to the Program.

3.0 TEAM ROLES AND RESPONSIBILITIES

A Stakeholder Team provided programmatic direction and process validation to the PBS-SR-0014 Risk Assessment and Opportunity Team. The Stakeholder Team was composed of DOE and contractor upper level managers responsible for execution of PBS-SR-0014. The PBS-SR-0014 Risk Assessment and Opportunity Team was composed of individuals from both DOE and the contractor and selected to participate based upon their diverse knowledge and expertise. Additionally, where practical, risk owners participated as members during assessment and update of their assigned risks. The members for each Team were as shown in Table 2:

Table 2 – Team Members

Stakeholder Team	
Name	**Organization**
James L. Folk Jr.	DOE
Stuart A. MacVean	SRR
Mark A. Schmitz	SRR
Risk and Opportunity Assessment Team	
Name	**Org – Function[1]**
Patricia C. Suggs	DOE – Risk Owner
Robert K. Leugemors	DOE – SWPF
Pamela A. Marks	DOE – Risk Owner
Mark A. Smith	DOE – Risk Owner

Gary N. Howard	DOE – Team Member
Jolene K. Seitz	DOE – Team Member
Jean M. Ridley	DOE – Risk Owner
Sonitza M. Blanco	DOE – Risk Owner
Phillip T. Ramsey	DOE – Team Member
Carl A. Lanigan	DOE – Risk Owner
William J. Copeland	DOE – Team Member
Pauline N. Hang	DOE – Team Member
Donald J. Blake	DOE – Team Member
J. Kent Fortenberry	SRR – Risk Owner
Roberto E. Gonzalez	DOE – Team Member
Jeffrey L. Bentley	DOE – Team Member
Dickson A. Boadi	DOE – Team Member
Anthony S. Palmer	DOE – Team Member
Rachel M. Zoss	DOE – Team Member
Shane S. Farrell	DOE – Risk Owner
Rodney P. Crossley	SWPF – Team Member
Scott H. Macklin	SWPF – Team Member
Kent D. Gilbreath	SRR – Team Member
Eric J. Freed	SRR – Risk Owner
Peter J. Hill	SRR – Risk Owner
Mark T. Keefer	SRR – Risk Owner
John S. Contardi	SRR – Risk Owner
Phillip W. Norris	SRR – Team Member
Brent A. Gifford	SRR – Risk Owner
Michael N. Borders	SRR – Risk Owner
Keith D. Harp	SRR – Risk Owner
David P. Seymour	SRR – Risk Owner
John R. Gregory	SRR – Team Member
John E. Occhipinti	SRR – Risk Owner

Keith R. Liner	SRR – Risk Owner
Kim A. Hauer	SRR – Risk Owner
William P. Mayson III	SRR – Risk Owner
Brandon W. Witt	SRR – Risk Owner
Delane Maxwell	SRR – Risk Owner
Steven A. Thomas	SRR – Risk Owner
George J. Matis	SRR – Risk Owner
Ryan T. McNew	SRR – Risk Owner
Richard E. Edwards Jr.	SRR – Risk Owner
Larry B. Romanowski	SRR – Risk Owner
Bruce E. Long	SRR – Team Member
Jim Rugg	SRR – Risk Owner
Noel F. Chapman	SRR – Team Member
Owen D. Stevens	SRR – Risk Owner
Thomas H. Huff	SRR – Risk Owner
Janice D. Williams	SRR – Risk Owner
Guy G. Campbell	SRR – Risk Owner
Gavin C. Winship	SRR – Risk Manager

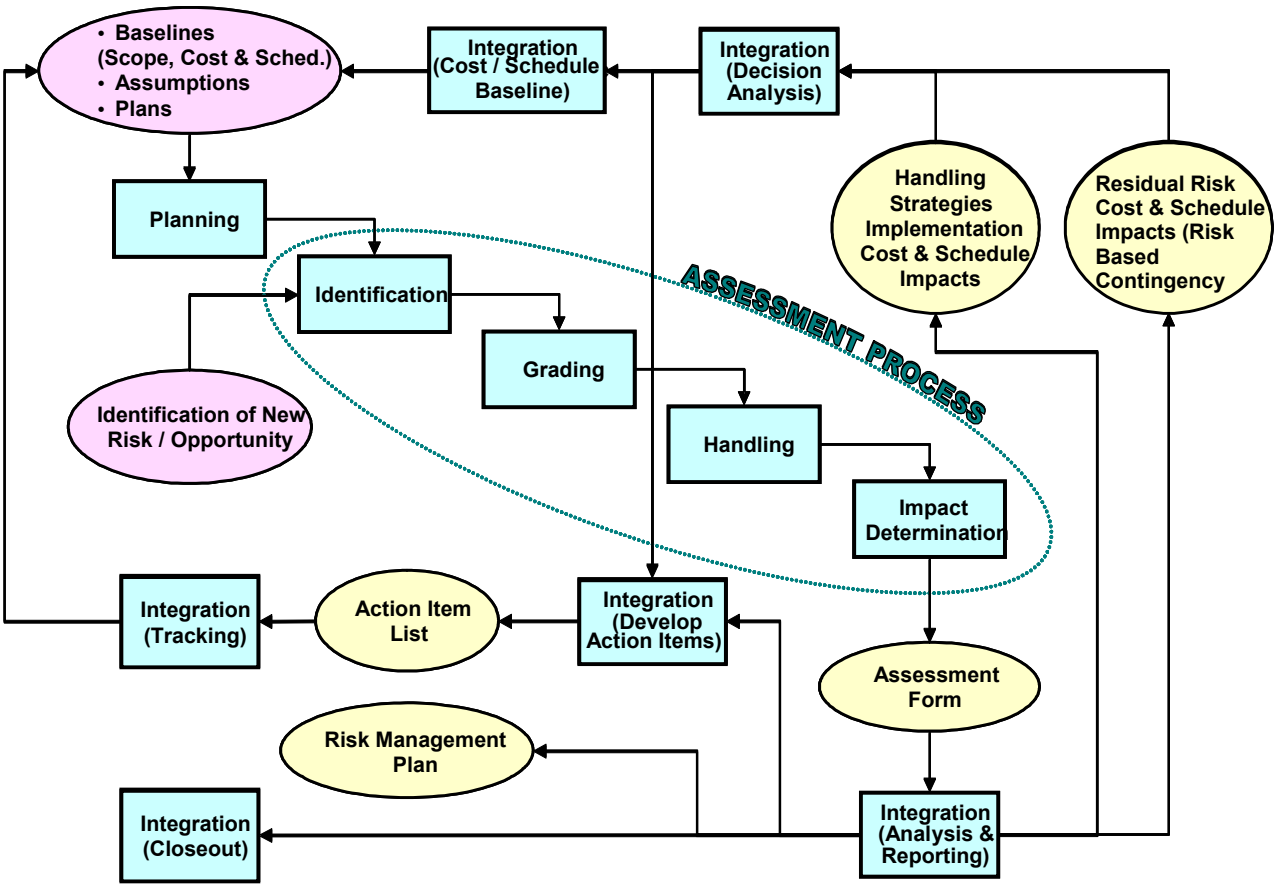
[1]Risk Owners have ownership of one or more risks in this ROMP, other Team Members provided input during specific risks sessions

Additional subject matter expertise was utilized by bringing experts into the assessment at appropriate points for the purpose of: a) brainstorming; b) reviews of developed risk data during grading, c) impact determination; d) risk handling strategy development and e) integration activities. Subject matter experts were typically drawn from many areas, e.g. project/operations activity owners, facility operations, research and development, planning, project/operations activity execution and technical staff, etc. Review by Legal Counsel was also performed as part of Subject Matter Expert participation.

4.0 RISK AND OPPORTUNITY MANAGEMENT PROCESS

This section defines the R&O management process to be utilized. The R&O process shown below in Figure 2, implements the requirements of DOE Order 413.3B (Reference 3) through a tailored application of the guidance given in DOE G 413.3-7A, (Reference 4) and by adoption of the Systems Engineering methodologies developed for use at SRS in the SE Methodology Guidance Manual (Reference 7).

Figure 2 – R&O Process



4.1 PLANNING

Planning involves tailoring the R&O management elements to the scope of the specific PBS assessment. The previous assessment utilized R&O management elements during assessment activities appropriate for scope defined by System Plan Revision 19 (Reference

8). During this update the team members (identified in Section 3) were responsible for reviewing and validating the previous R&O management elements and as appropriate updating them to align with the PBS-SR-0014 scope. The following activities define the activities involved in the planning phase:

- Confirm the R&O management elements to be performed,
- Define the PBS-SR-0014 Assessment Scope (documented in Section 2.0)
- Develop a planning model for the assessment process,
- Review, and where appropriate, update assessable elements to envelope the PBS,
- Review, and where appropriate, update Categories for risk types,
- Review, and where appropriate, update the risk likelihood and consequence criteria definitions to be used for the PBS assessments,
- Review, and where appropriate, update the Opportunity Likelihood and Benefit Criteria definitions to be used for the PBS assessments, and
- Select key Operations, Engineering and other Subject Matter Experts
- Identify any changes to the method for tracking and reporting progress on handling strategy actions

4.2 IDENTIFICATION

Identification is an organized approach for determining the events likely to affect the PBS scope and for documenting the characteristics of those events through a description of the event which may happen, how it could affect the task under consideration, and a basis explaining why this event is considered a "risk" or an "opportunity." A risk is the potential outcome of an event, with detrimental impacts to an activity such as failure of a program to achieve mission objectives, exceeding cost and schedule constraints or negative impacts to environment and personnel safety. An opportunity is the potential outcome of an event to improve performance, cost, or schedule of an activity or process.

R&Os are identified by review of: a) existing risk data; b) identified issues (e.g. IRL); c) assumptions; d) uncertainties; e) brainstorming; f) pre-mortems; and by g) eliciting team discussion.

Risks and/or opportunities are identified and documented by answering the following questions:

- What is the baseline? – The normal situation for the element containing the risk or opportunity (e.g., assumption, design basis).

- What is the event? – The incident, occurrence, circumstance, etc., which may happen and is different from the normal situation.
- What is the impact? – A statement of what effect or result the event will or could have on the normal situation (including performance, cost, and schedule impact).

This information is documented on Risk and Opportunity Assessment Forms (ROAFs) (Appendix E). This information creates the PBS-SR-0014 R&O database (Risk Register) and provides the basis for managing R&O.

4.3 GRADING

Grading involves determining the likelihood of an occurrence and the consequences of occurrence in the absence of any handling strategy to identify the "Risk or Opportunity Level." Following team discussion and reaching consensus, likelihood and consequence values and their associated bases are documented on the ROAF. This level represents a judgment as to the relative risk or opportunity to the scope as a whole and is categorized as Low, Moderate or High.

As discussed in Section 4.1, the likelihood and consequence criteria unique to PBS-SR-0014 assessment scope are defined by the team during the Planning Phase. Individual ROAF likelihood and consequence are applied to Figures 3 or 4 to determine individual ROAF risk or opportunity levels.

Figure 3 – Risk Level Matrix

Likelihood (L)	Negligible	Marginal	Significant	Severe (Critical)	Very Severe (Crisis)
Very Likely	Low	Moderate	High	High	High
Likely	Low	Moderate	Moderate	High	High
Unlikely	Low	Low	Moderate	Moderate	High
Very Unlikely	Low	Low	Low	Moderate	High

Consequence (C)

Figure 4 – Opportunity Level Matrix

Likelihood (L)	Negligible	Marginal	Significant	Exceptional
Very Likely	Low	Moderate	High	High
Likely	Low	Moderate	Moderate	High
Unlikely	Low	Low	Moderate	Moderate
Very Unlikely	Low	Low	Low	Moderate

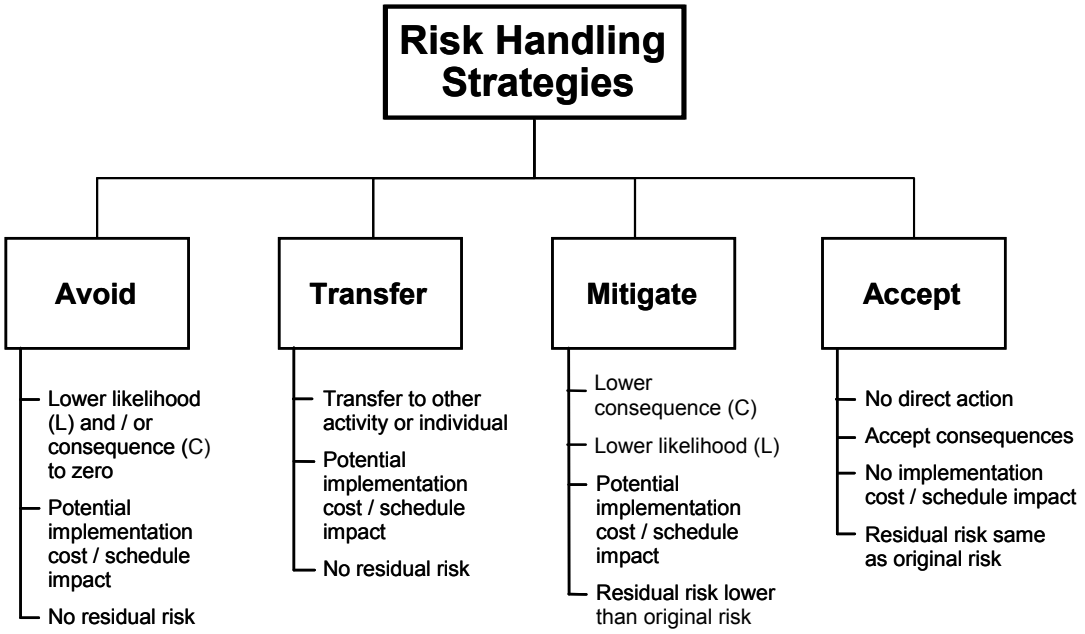
Benefit (B)

4.4 HANDLING

4.4.1 Risk-Handling Strategies

Risk-handling strategies (RHS) are developed to eliminate, or at least reduce, the likelihood or consequences of a risk. Risks with risk levels of "moderate" or "high" will normally have strategies to avoid, mitigate or transfer the risk. When selecting a handling strategy, ease and effectiveness of implementation (cost and schedule impacts) should be considered. Low risks are evaluated for simple and cost-effective handling strategies. Low risks may be accepted with no further action. Figure 5 shows the differing RHSs which may be employed to eliminate/minimize the risk.

Figure 5 – Risk Handling Strategies



The most desirable RHS is "avoid," as when this strategy is implemented, there is no residual risk. Avoid strategies must be closely monitored to ensure they are being effective and risks will remain open or "active" until such time as the strategy has been completed and the risk re-assessed as being avoided. Mitigate is the next most desirable RHSs as this results in a lowered residual risk "Transfer" is a less desirable RHS as accountability for handling a transferred risk now resides outside of PBS-SR-0014 making status difficult to track. "Accept" is the least desirable of all RHSs as this strategy does nothing to reduce or mitigate the risk; it simply allows the full consequences of the risk to impact the program should the risk occur. For this reason it is recommended not to be used on risks graded as other than low.

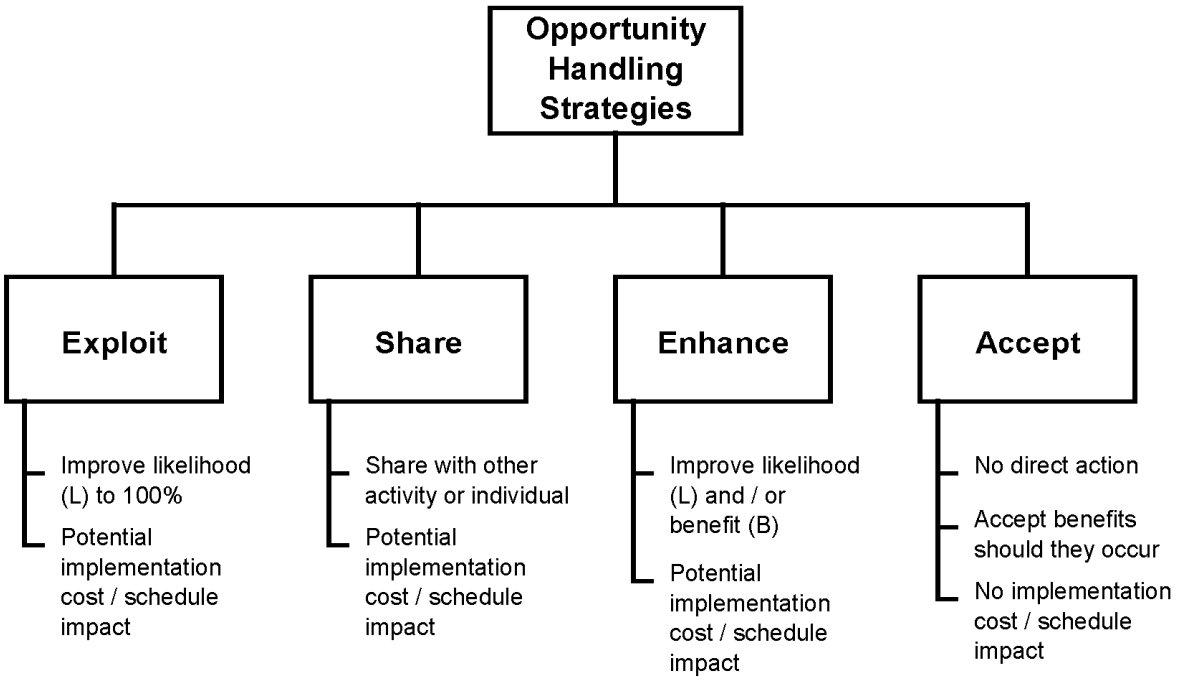
Based on the RHS, the likelihood and consequences are re-evaluated to determine "how much" the risk level will be lowered, e.g., from a high to moderate level by taking credit for the defined RHS. If the risk is not completely eliminated through implementation of the RHS, residual or remaining likelihood, consequences, associated uncertainties (in terms of cost or schedule impacts), and risk level documented on the ROAFs. Effectiveness of the RHS is determined by grading of residual risk level. Estimated cost and schedule for implementing the strategy is also documented on Risk and Opportunity Assessment Forms.

RHSs are normally implemented via one or several action items. These action items are documented on the ROAFs. Each action item will be tracked and monitored via the action item listing database (Appendix F).

4.4.2 Opportunity-Handling Strategies

Opportunity-handling strategies (OHS) are often developed for the "moderate" or "high" opportunity levels in an attempt to exploit, enhance, or share the opportunity. "Low" opportunities should be evaluated for simple and cost-effective handling strategies. Figure 5 shows handling strategies which may be employed to maximize benefit to contract scope. OHSs and actions are documented on Risk and Opportunity Assessment Forms (Appendix E).

Figure 6 – Opportunity Handling Strategies



4.5 IMPACT DETERMINATION

R&O impact determination results from evaluation of R&O cost and schedule impacts on PBS scope completion. It includes cost to implement handling strategies and any technical and programmatic uncertainties remaining after successful implementation of the risk-handling strategies, i.e., residual risk levels.

To facilitate this process, estimates are obtained for cost and schedule impacts of implementing recommended handling strategies for each R&O assessed. Each impact is reviewed by the responsible DOE SR Federal Project Director or designee, Contractor Manager or designee, and the Contractor Cost Estimator, against the existing PBS cost and schedule baselines to ensure the uncertainty associated with the risk has not already been factored into the cost estimate range and schedule. If the handling strategy has not already been integrated into the PBS cost baseline, then it is identified as such on the ROAF and costs must be added to the baseline. If the R&O handling strategy schedule impacts are not already integrated into the PBS schedule, then impacts must be factored in the schedule as well.

In addition, the team provided estimates for cost and schedule impacts of residual risks (best, most likely, and worst). These data were used to determine the residual risk level.

4.6 INTEGRATION

Integration is the incorporation of R&O actions into the PBS baseline. This entails documentation of the steps identified in Sections 4.1 through 4.5 and management of the R&O handling strategy action items. It includes the following elements:

- Making decisions on course of actions to pursue
- Adding necessary funding to the PBS budgets
- Adding required time to PBS schedules
- Reporting Results:
    - Documenting PBS assessment via the ROAFs,
    - Periodic re-assessment, revisions to the ROMP,
    - On-going status of R&O handling actions through periodic DOE-SR and contractor discussions,
- Developing handling strategy action items, if not already identified
- Tracking implementation of R&O handling strategy action items using STARs
- Developing and maintaining an IRL that tracks proposed new risks, opportunities and changes to PBS risks and opportunities
- Developing and maintaining a riskometer that provides a summary of individual risk levels and activities being pursued to manage the risks
- Establishing a joint DOE-SRR Risk Management Board (RMB) to perform reviews of the IRL, near-term window for action item completion and Riskometer

- Trending to ensure existing risk levels are decreasing and opportunities are being realized.

5.0 RISK MANAGEMENT IMPLEMENTATION

5.1 PLAN DEVELOPMENT

Prior to starting PBS-SR-0014 risk management update, a planning model was developed. This planning model is shown in Figure 7. The model was developed to ensure all appropriate R&O management elements were included in the PBS-SR-0014 risk update activities and logically ordered and scheduled to optimize efficiency of the team and minimize iterations. Confirmation of the planning model was obtained from DOE Federal Project Management as the initial step in the PBS-SR-0014 risk update process.

The risk categories used during this update are defined in Table 3:

Table 3 – SRS PBS Risk Categories

Risk Category #	Risk Category Title
1	Design
2	Regulatory and Environmental
3	Resources/Conditions
4	Safeguards and Security
5	Technology
6	Procurement
7	Construction Strategy
8	Testing
9	Safety
10	Project Integration / Interfaces
11	Management
12.1	Process Performance – Flowsheet Issues
12.2	Process Performance – Equipment/Infrastructure Failures

After validation of the planning model, the team reviewed and updated scope and implementation assumptions of PBS-SR-0014 (this information can be found in Section 2 of this plan). After the scope and assumptions were updated, assessable elements were reviewed and updated as appropriate for the scope. The assessable elements cover the entire scope of PBS-SR-0014 and were derived by performing a simplistic functional analysis on the PBS. The assessable elements are used to guide the team through the brainstorming sessions to ensure all elements of PBS-SR-0014 have been assessed. To enable a correlation of risk to PBS Work Breakdown Structure (WBS) Elements, the WBS element associated with the risk event was added to each ROAF.

The PBS-SR-0014 assessable elements are shown in Figure 8.

Figure 7 – PBS-SR-0014 Risk Update Planning Model

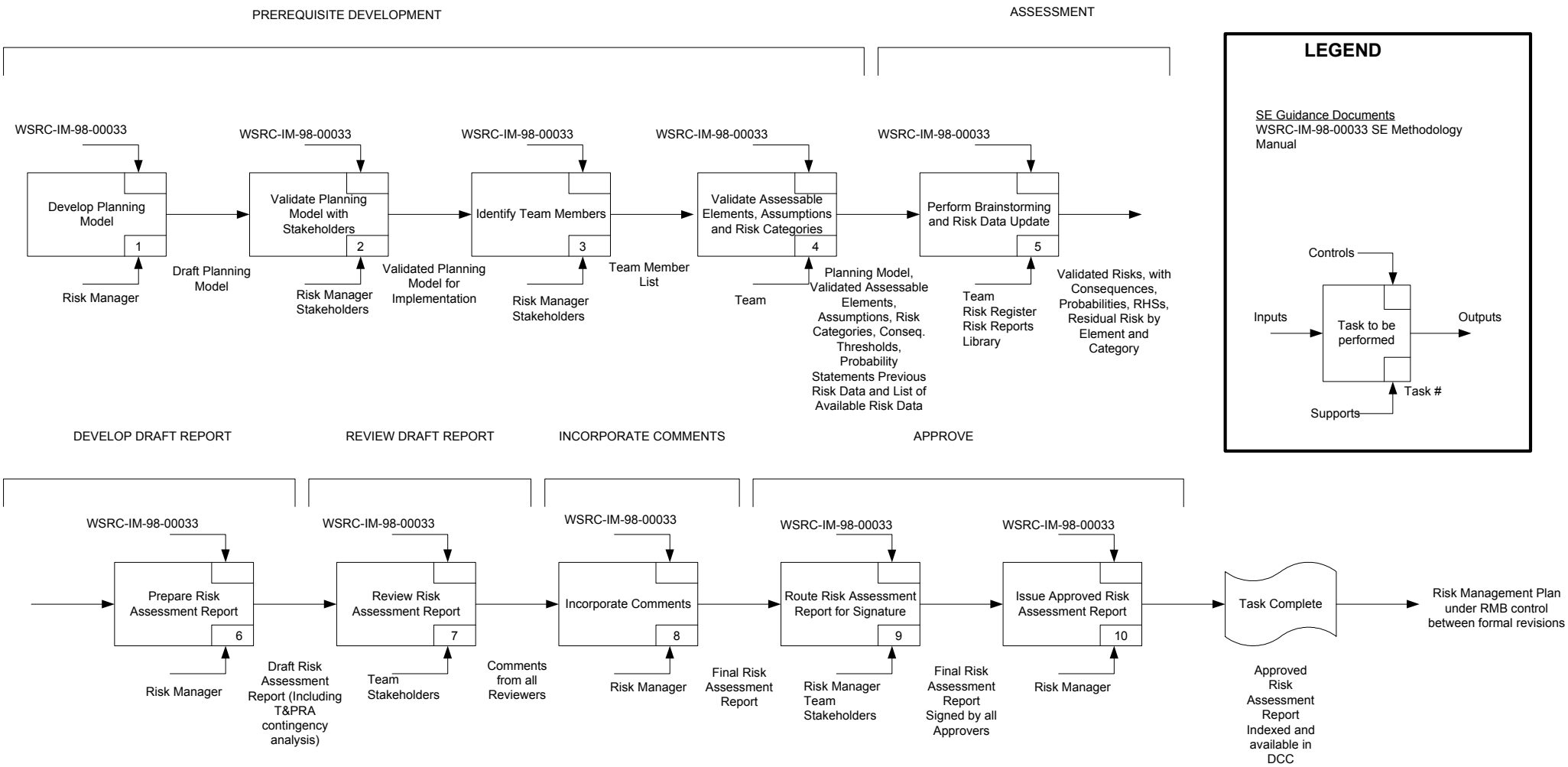
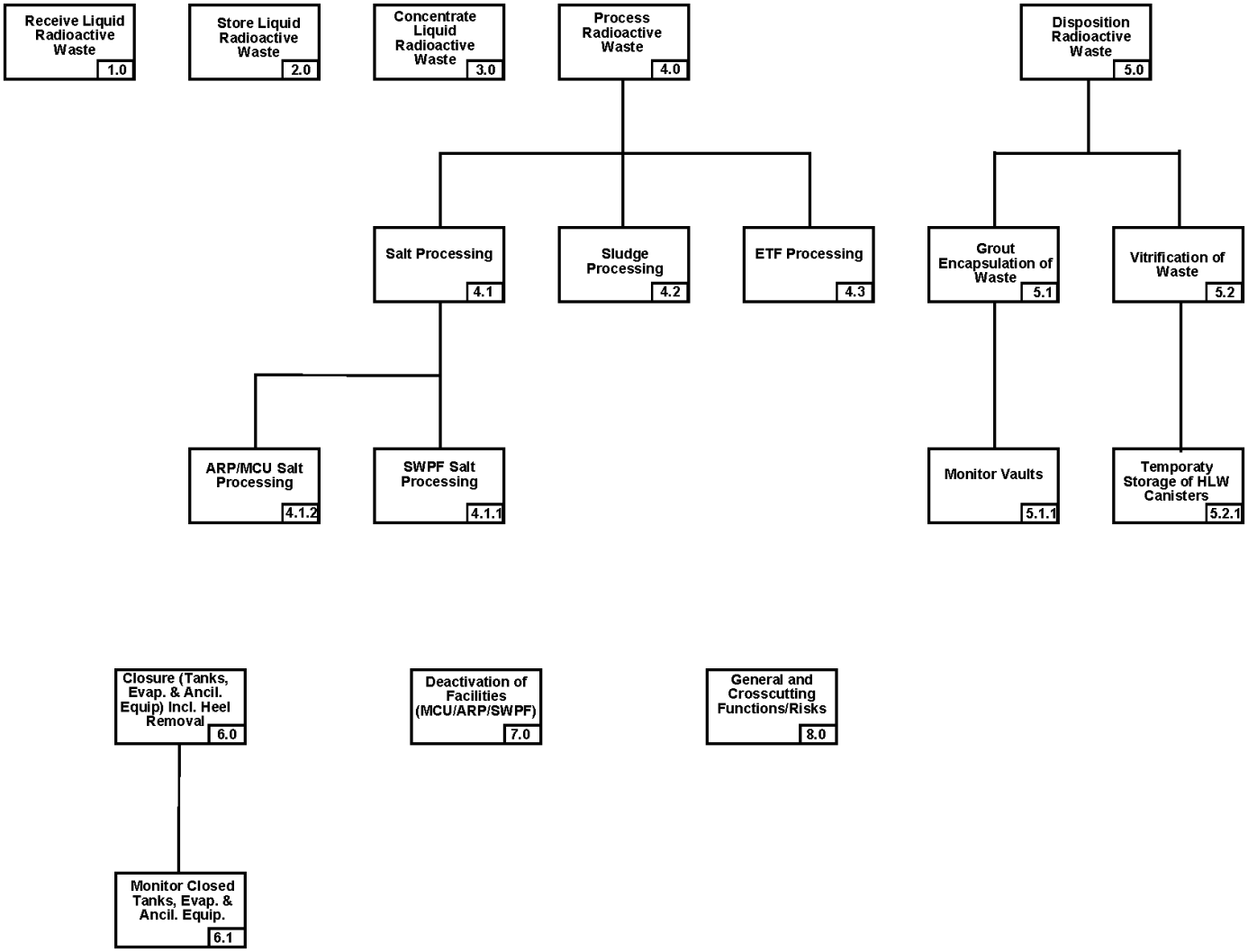


Figure 8 – PBS-SR-0014 Assessable Elements



The previous PBS-SR-0014 risk assessment had developed criteria and guide words for likelihood and consequence. These criteria were reviewed by the team. The existing likelihood criteria were validated, and the consequence criteria updated based on the latest data. These are shown in Tables 4 and 5 respectively:

Table 4 – PBS-SR-0014 Risk Likelihood (Probability) Criteria

Probability of Occurrence (P_R)		Criteria
Descriptive	**Numerical**	
Non-Credible	N/A	• Determined to have a probability of occurrence of $\leq 10^{-6}$ (or other non-credible probability defined for the activity)
Very Unlikely	> 0 but < 0.15	• Will not occur anytime within multiple WSDP life cycles; or • Development is at least at the stage of a system prototype demonstration in an operational environment up to an actual system in service proven through successful mission operations; or • Estimated recurrence interval > 50 years; or • Estimated recurrence frequency < 1 (i.e., event not expected to recur); or • 0 < Probability of single event occurrence < 0.15.
Unlikely	≥ 0.15 but < 0.45	• Will not occur in the WSDP life cycle; or • Development is between the stages of component and/or breadboard validation in a laboratory environment and system/subsystem model or prototype demonstration in a relevant environment; or • 25 years < Estimated recurrence interval ≤ 50 years; or • 1 ≤ Estimated recurrence frequency < 2 (i.e., event expected to recur, but not more than once); or • 0.15 ≤ Probability of single event occurrence < 0.45.
Likely	≥ 0.45 but < 0.75	• May occur sometime during the life cycle of the WSDP; or • Development is between the stage of technology concept and/or application formulation and the stage of analytical and experimental critical function and/or characteristic proof of concept; or • 10 years < Estimated recurrence interval ≤ 25 years; or • 2 ≤ Estimated recurrence frequency < 5 (i.e., event expected to recur from 2 to 4 times); or • 0.45 ≤ Probability of single event occurrence < 0.75.
Very Likely	≥ 0.75 but < 1	• Very likely to occur sometime during the life cycle of the WSDP; or • Only basic principles (or less) are observed and reported; or • Estimated recurrence interval ≤ 10 years; or • Estimated recurrence frequency ≥ 5 (i.e., event expected to recur more than five times); or • 0.75 ≤ Probability of single event occurrence <1.

Table 5 – PBS-SR-0014 Risk Consequence Criteria

Consequence of Occurrence	Criteria
Negligible	• Minimal consequences. • Negligible impact on program; slight potential for PEP schedule change; compensated by available schedule float. • Cost estimates exceed budget by < $163M • Slip in schedule of < 3 months.
Marginal	• Moderate threats to program mission; may require minor facility redesign or repair. • Cost estimates exceed budget by ≥ $163M to < $650M. • Slip in PEP schedule of ≥ 3 months to < 1 year.
Significant	• Significant threat to program mission; requires some facility redesign or repair. • Cost estimates exceed budget by ≥ $650M to < $1,300M. • Significant slip in PEP schedule of ≥ 1 year to < 2 years.
Severe (Critical)	• Serious threat to program mission; possibly completing only portions of the mission or requiring major facility redesign or rebuilding. • Cost estimates exceed budget by ≥ $1,300M. • Excessive PEP schedule slip of ≥ 2 years.
Very Severe (Crisis)	• Catastrophic impact to PEP mission completion. • Requires instant response with low chance of success.

Notes to Table 5 Consequence criteria:

- Special attention must be given to "First-of-a-Kind" risks because they are often associated with project failure. "First-of-a-Kind" risks should receive a Severe (Critical) or Very Severe (Crisis) consequence estimate unless there is a compelling argument for a lesser consequence value determination.
- "First-of-a-Kind" risks are those associated with projects or modifications unique in their design, purpose, and/or application of technology. Typically, no other similar project or application of the technology in full-scale operation is available from which to obtain historical information with respect to risk.
- Any one or more of the criteria in the five levels of consequence may apply to a single risk. The consequence level for the risk being evaluated must be based upon the highest level for which a criterion applies.

Facility costs were used for assessing impacts of risks. These cost projections were based on actual historical costs or Budgeted Cost of Work Scheduled from the Contract Performance Baseline or best budgetary information available at the time of assessment. Costs beyond the current baseline were escalated to FY27 dollars at planned full operation.

The cost of Program delay was determined to be an approximate annual cost for purposes of this risk evaluation, based on continued operation of the Liquid Waste facilities including the waste transfer infrastructure. For Program delay, a rounded value of $650M/year was used. This cost would accommodate extended operations of the entire LW System which includes those elements shown in Table 6:

Table 6 – PBS-SR-0014 Estimated Program Extension Costs

Facility	Impact ($ Millions/Year)	Basis
Tank Farm Operations	197	Cost of extended operation per year (rounded)
Waste Treatment (DWPF/Saltstone)	179	Cost of extended operation per year (rounded)
SWPF Operations	80	Cost of extended operation per year (rounded)
Program Support	51	Cost of extended operation per year (rounded)
Legacy Costs	7	Cost of extended operation per year (rounded)
Fee	31	Cost of extended operation per year (rounded)
Other (SDU, BWR, Closure & Glass Waste Storage)	108	Cost of extended operation per year (rounded)
Total	~650	

Additional cost impacts associated with individual risks are identified on ROAFs (Appendix E). For most project risk assessments, schedule delays are evaluated separately. For risk assessments at the PBS-SR-00014 level, schedule delays largely drive costs associated with each risk in terms of additional operating life costs. The additional life-cycle cost of schedule delay is included along with other costs shown as a total estimated cost on the ROAFs.

Opportunities were also identified and evaluated using a similar technique. The criteria developed for opportunities are shown in Tables 7 and 8.

Table 7 – PBS-SR-0014 Opportunity Likelihood (Probability) Criteria

Likelihood of Realization	Criteria
Very Likely	• 0.75 ≤ Likelihood of benefit realization < 1
Likely	• 0.45 ≤ Likelihood of benefit realization < 0.75
Unlikely	• 0.15 ≤ Likelihood of benefit realization < 0.45
Very Unlikely	• 0.15 > Likelihood of benefit realization > 0

Table 8 – PBS-SR-0014 Opportunity Benefit Criteria

Benefit of Implementation	Criteria
Negligible	• Minimal benefit; unimportant • Some potential transfer of money, but budget estimates unchanged • Negligible impact on program; slight potential for reduction in schedule
Marginal	• Small improvement in technical performance • Moderate improvement to the mission • Cost estimates reduced by up to $10M • Minor reduction in schedule
Significant	• Significant improvement in technical performance • Significant improvement to the mission • Cost estimates reduced between $10M and $100M • Significant reduction in schedule
Exceptional	• Technical goals of the program improved • Exceptional improvement to the mission, environment, or people • Cost estimates reduced over $100M • Exceptional reduction in schedule

Note: Any one or more of the criteria in the four levels of benefits may apply to a single opportunity. The overall benefit level for the opportunity being evaluated must be based upon the highest level for which a criterion applies.

5.2 RISK IDENTIFICATION

For the ROMP update, several approaches were taken during the risk update sessions to ensure the risk profile of the PBS-SR-0014 program was obtained at a level of detail commensurate with increasing complexity of the PBS:

- Reviewed, resolved and closed all open IRL entries since the previous update
- Identified and reviewed risk documents issued within PBS-SR-0014 since the last update (Appendix A)
- Reviewed STARs database
- Reviewed previous PBS-SR-0014 risks with risk owner/representative in attendance
- Brainstormed Assessable Elements

By attacking the problem of risk identification in this manner, the team ensured risk population was fully comprehensive and representative of the scope of PBS-SR-0014.

To maintain continuity between risk update periods, the list of additional documentation reviewed is provided in Appendix A and the IRL is provided in Appendix B.

As with the previous PBS-SR-0014 risk assessment (Reference 1), it must be noted that risk assessment and analysis is a dynamic and ongoing process and at any given time there are a number of risk assessments in progress. This review was however, limited to approved and issued documentation/data.

Risk identification and review resulted in new, closed and combined risks as follows:

<u>New Risks Identified (28)</u>

452 As Found Field Configurations on Old Style Tanks do not Match Technical Baseline
454 Gas Retention in Waste Impacts Bulk Waste Removal
455 TSR Limit Prevents Tank Entering Closure Mode After Cleaning has Been Completed
457 SCDHEC do not Allow Temporary Use of Old Style Tanks After BWRE
458 Targeted Sludge Tank Does not Contain Predicted Quantity of Sludge
459 Warehouse Fire Destroys Critical Equipment (Excluding Melters) (DOE Risk)
460 SDUs are Not Available When Required (Acquisition Delays) (DOE Risk)
461 Additional Requirements Imposed on Tank Farm Operation Due to Hanford Vapor Issues
462 Increased Aluminum due to Aluminum Dissolution Creates Precipitation During Processing
463 Increased Level of Mercury in Saltstone Grout
464 3H Evaporator Operations Impacted by Increased Mercury Levels
465 2H Evaporator Operations Impacted by Increased Mercury Levels
466 Increased Levels of Mercury in HLW System Creates Industrial Hazards
467 Oxalates Impact Salt Processing
468 DWPF Sand Filter is Expended Before Design Life is Reached
469 Sampling Requirements at MCU Prevent Maximum Throughput of above 2 Mgals/yr
470 Processing Higher Curie Feed Increases MCU Outage Durations
471 Tank 50 Cannot be Transferred to Saltstone
472 DOE Directs Additional Business/Project Requirements on Lower Level Activities (DOE Risk)
474 Tank 49 and 21 Decanting to Feed MCU Requires Filtration
475 ARP Cannot Support MCU throughput.
476 DWPF Flammability Issue Resolution Constrains Throughput
477 Multiple Flowsheet Changes Result in Processing Issues
479 TCCR is Not Available When Planned
480 TCCR Does not Perform as Required

481 Downstream Flowsheet Impacts from TCCR Ion Exchange Media
483 Coatings Applied to Interiors of SDUs 2, 3, 5 and 6 are Inadequate
484 After Aluminum Dissolution, Remaining Aluminum Impacts Processing

Risks Closed (12)

266 Waste Determination (WD) Approval Does Not Support System Plan (DOE Risk) - On December 19, 2014 the Secretary of Energy signed the HTF Waste Determination. Issuance of the HTF Waste Determination represents the last of the three planned waste determinations for Liquid Waste Facilities (HTF, FTF, and Salt Waste Disposal). Based on issuance of the HTF Waste Determination. This risk is closed.

381 Implementation of DNFSB Recommendation 2004-2 Creates Additional Rework (DOE Risk) - DNFSB Recommendation 2004-2 was closed by DNFSB (Reference Letter July 15, 2014, Peter S. Winokur, Chairman DNFSB to Ernest J. Moniz, US Secretary of Energy). This risk is closed.

399 SWPF WAC Changes - Any significant uncertainties with SWPF WAC (driven by SWPF) have been resolved. If any changes are made, they are considered to be minor and are covered under Risk 290. Any changes to SWPF WAC external to SWPF (i.e. driven by HLW System issues) are addressed within the flowsheet risks included in this ROMP. This risk is closed.

407 Seismic Response Spectra Acceleration Values Increase (DOE Risk) - Report K-ESR-G-00021 "Savannah River Site Probabilistic Seismic Hazard Analysis (PSHA) Update - 2014" was issued 11/3/14. This technical report documents the work completed in support of the Savannah River Site (SRS) PSHA update. The current PSHA report was finalized in 1997 (Ref. WSRC 1997). The Department of Energy (DOE) Order 420.1B requires the following (Ref. DOE 2005). An NPH assessment review must be conducted at least every 10 years and must include recommendations to DOE for updating the existing assessments based on significant changes found in methods or data. If no change is warranted from the earlier assessment, then this only needs to be documented. The compiled data indicated no significant changes, which supports SRS continued use of the existing site-wide probabilistic model of shear-wave velocity profiles. This risk is closed.

433 Repository Rejects Sludge Modifier Canisters (DOE Risk) - System Plan 20 no longer requires sludge simulant to be used in lieu of sludge in canister production to support processing SWPF waste streams (strip effluent and MST/sludge solids). Sludge and SWPF waste processing will be closely coordinated to ensure sludge is available, and where necessary modifier (iron) will be used to chemically adjust DWPF feed. This risk is closed.

441 Contamination is Released from Used Equipment Containers - The oldest and more deteriorated equipment containers have been dispositioned, leaving newer containers which have minimal risk. The processes used to monitor these containers would relatively quickly identify any leakage and it would be remediated with minimal impact. This risk is closed,

442 FY14 SDF SA (SDU 6 SA) Not Accepted By DOE - DOE has approved the FY2014 SDF SA and the SA has been implemented. This risk is closed.
447 Implementation of DOE O 420.1C Results in Rework to Existing Facilities and Programs (DOE Risk) - This risk has been realized and is now closed.
464 3H Evaporator Operations Impacted by Increased Mercury Levels - After evaluation it was determined that the impact of this risk is not sufficient to warrant inclusion in the Program ROMP. This risk is closed.
465 2H Evaporator Operations Impacted by Increased Mercury Levels - After evaluation it was determined that the impact of this risk is not sufficient to warrant inclusion in the Program ROMP. This risk is closed.
474 Risk has been realized and it has been determined that filtration will be necessary and will be performed using the 512-S cross-flow filter until such time as SWPF is brought on line. This risk is closed.
475 ARP Cannot Support MCU Throughput - This risk is a duplication of Risk 424 - Salt Processing Limited by Actinide Removal Capacity. Risk is closed.

Risks Combined (0)

None

Opportunity identification and review resulted in new and closed opportunities as follows:

New Opportunities (5)

453 Perform Interim Salt Processing Without an MST Strike
456 Spread Cement Bags Evenly in Vault 4
473 Remove Interior Coating Requirement from SDU Design
478 Modify SWPF WAC to Use Al/Hydroxide Ratio in Lieu of Fixed Limits
482 Deploy TCCR on Multiple Tanks to Accelerate Tank Closure

Opportunities Closed (10)

368 Use Higher Capacity Canisters at DWPF - Currently, this opportunity is not being pursued and investigation into the use of higher capacity canisters at DWPF has been placed on hold. This opportunity is closed.
382 Develop and Deploy At-tank and In-situ Characterization Techniques. - Not considered a feasible opportunity at this time based on results of investigation into available technology. Opportunity is closed.
386 Remove Organic Controls From Design of SDUs - This opportunity has been realized. No active ventilation is required for SDU 6 onwards. This opportunity is closed.
406 Process the Contents of Tank 48 Early - Based on this latest assessment, the previous benefit of Program duration reduction is not forecast and the benefit is marginal at

best. This opportunity is no longer considered realistic and would not be planned for. This opportunity is closed.

411 Perform Lay-up of Vault 4 - Based on the results of the Systems Engineering Evaluation it has been determined that a business case does not exist for recommending near-term interim closure of Vault 4. This opportunity is closed.

412 Saltstone Water Usage Minimization - No longer considered a viable opportunity as an upset (plugged line) during flushing with DSS would result in DSS being held in transfer line. Opportunity is closed.

432 Large Tank MST Strike (with improved filtration) Enables ARP/MCU Throughput Increase - This opportunity has been included within the baseline. Opportunity is closed.

434 Balance SOL with Salt Processing - This opportunity has been realized and exploited in System Plan Revision 20. Opportunity is closed.

444 Optimize Near Term Cs Ci Throughput of ARP/MCU - The cost of implementing this opportunity would diminish the benefit greatly and to such a degree this is no longer considered feasible. Opportunity is closed.

478 Modify SWPF WAC to Use Al/Hydroxide Ratio in Lieu of Fixed Limits - Upon further investigation, the use of OLI modeling and the current salt batch planning process (which balances al/hydroxide during source selection and blending) already plans for minimizing the use of additional caustic. This opportunity is closed.

All remaining risks and opportunities were carried over to grading. A total of 25 new risks and 3 new opportunities were carried over to grading.

5.3 GRADING

Before risk grading could begin, all risks were reviewed and validated.

The team reviewed each risk and came to a consensus on the updated or new wording of the risk statement, initiating event and the likelihood and consequences of the event being allowed to occur without any risk handling strategy applied. The tables developed during the planning phase (Tables 4 and 5) were used to bin the likelihood and consequences for each risk. The likelihood and consequences were used to determine the risk level by using the Risk Level Matrix (Figure 3).

A summary risk table (Appendix C) shows these risks. Risks can be found in detail on the individual ROAFs (Appendix E).

A similar approach was taken for opportunities (using Tables 7 and 8). A summary opportunity table shows these opportunities (Appendix D) and opportunities can be found in detail on the individual ROAFs (Appendix E).

5.4 HANDLING

After the team had completed risk grading, the next steps were to update existing RHSs, develop new RHSs and proceed to identify methods to reduce the risk level. Handling strategies were identified for each risk with the goal of cost effectively driving risk level down to a more manageable residual level. Strategies to mitigate, avoid and accept were employed. The team did not employ any "transfer" strategies as these have proven difficult to implement in the past. As a goal, no high or moderate risks were desired to be accepted, and acceptance of low risks was contingent on not being able to identify a cost effective risk handling strategy. No risks were accepted without an exhaustive investigation into alternatives for risk handling strategies. Risk handling strategies applied are shown in summary in Appendix C, in detail in Appendix E and their implementing action items identified in Appendix E. Each action item has a scheduled completion date. Where several intermediate actions are required e.g. items associated repetitively with each tank closure, the last completion date is shown, and the intermediate actions will be scheduled individually within the STAR system.

5.5 IMPACT DETERMINATION

The team then determined residual risk, i.e. the risk remaining after the risk strategy was applied. This risk took the form of a best case, most likely case and worst case residual impact and a likelihood of occurrence. When determining impact, it was necessary to estimate the dollar value (best case, most likely case and worst case) of the portion of residual impact which would affect PBS-SR-0014 in the near term and in the outyears. The worst case value was used to grade the residual risk. The residual risk data was used to perform the T&PRA contingency analysis. (Refer to Section 5.6.5)

The profile of risks, risk handling strategies and residual risk was reviewed by the team and a further grouping was applied. Some risks could be realized in the near term and handled in the near term, (near term being defined as up to and including FY2021). Other risks could be realized in the outyears (being defined as after FY2021) and handled either near term or in the outyears. Other risks could be realized in the outyears and only handled in the outyears. It was necessary to develop groupings to reflect these differences as the groups would have differing priorities for implementation of risk handling strategies rather than being simply based on residual risk level. The groupings shown in Table 9 were developed and applied to the risk population:

Table 9 – PBS-SR-0014 Risk Groupings

Group	Near Term Risk	Outyear Risk	Near Term RHS	Outyear RHS	Near Term Consequences	Outyear Consequences
1	X		X		X	*
2	X		X			X
3		X	X			X
4		X		X		X

* Some Group 1 risks may have both near term and outyear consequences.

5.6 INTEGRATION

5.6.1 Action Items

Risk handling strategies developed by the team were broken down into action items where discrete actions were defined. Other, actions which were "institutionalized" in the execution approach or within plans and procedures were identified specifically in the description of the handling strategy. Each action item was described in detail and the individual and organization responsible for its execution was assigned. An estimate of risk handling strategy cost and schedule was also made where the RHS was not currently included in the baseline. These costs will be evaluated for addition to the PBS-SR-0014 cost baseline as part of routine management planning and budgeting activities. Action items can be summarized as shown within the Action Item Listing (Appendix F). Commensurate with their completion need date, action items will be entered into STARs, assigned owners and actively managed to completion. Additionally, when risks are closed, feedback will be provided to System Planning to ensure integration of any necessary changes in execution.

5.6.2 Riskometer

The status of PBS-SR-0014 risk can be summarized in a measurement tool, the riskometer, which integrates Program confidence in risk handling strategy success with the currently planned risk management activities and risk levels to show which risks specifically are of major, minor or acceptable concern to management. An example of the riskometer is provided (Appendix G). A similar tool may be used to status the implementation of opportunities. The opportunity measurement tool integrates the Program confidence in achieving the benefit of the opportunity with the planned opportunity handling strategies.

5.6.3 Interim Risk Log

An interim Risk Log (IRL) will be maintained throughout 2016-2017 to document any potential new risks, opportunities or events that may change the current assessment of PBS-SR-0014 risk as documented in this ROMP update. The IRL will form one of the principal inputs to the next ROMP update.

5.6.4 Risk Management Board

A joint DOE-SRR Risk Management Board has been established, and meets regularly to review the IRL items, action item status and riskometer for PBS-SR-0014. The RMB provides an opportunity for senior management to apply focus to emergent risks and assign actions to individuals and organizations to achieve cost effective and early handling of risks.

The Charter of the RMB is defined in Reference 10.

5.6.5 Risk Based Contingencies

The residual risk data, as described earlier, comprises of a best case, most likely case and worst case residual impact and a likelihood of occurrence. When determining impact, it was necessary to estimate the residual cost and schedule impacts (best case, most likely case and worst case) that would affect PBS-SR-0014 in the near-term, i.e. the Near-Term Baseline NTB (through FY2021) and in the outyear (through FY2022 to the completion of the PBS).

Risks were also identified as DOE or Contractor risks. DOE risks were defined as those generally falling outside of the Contractor's control, (e.g. regulatory changes, external Stakeholder issues, changes with an interfacing PBS, etc.).

This information is used in the development of Management Reserve (MR) and contingency. The derivation of MR and contingency is discussed in Section 5.7.

5.7 MANAGEMENT RESERVE AND CONTINGENCY

Management Reserve (MR) and Contingency are used to provide resources to combat the realization of technical and programmatic risks and the negative impacts of schedule and estimate uncertainty. MR is managed by SRR and accessed by an appropriate change control mechanism and is sometimes referred to as "Contractor MR." Contingency is managed by the DOE. MR and Contingency have been calculated for the Near Term Baseline (NTB) (or SRR Contract Performance Baseline), and approximated for the remainder of the PBS-SR-0014 execution outside of NTB which is termed the "Outyear Planning Estimate Range," (OPER). Both MR and Contingency are derived from the following components:

- Estimate Contingency
- Schedule Contingency
- T&PRA Contingency

5.7.1 Estimate Contingency

Estimate contingency addresses uncertainty within the CPB cost baseline. Estimate contingency will be established through the completion of a Monte Carlo simulation or through an assignment of direct percentage by senior Program management for operational activities based on an analysis of the estimate uncertainties. Monte Carlo simulation is performed using BECRAC® analysis software. This software utilizes a probabilistic determination method and yields the probability of overruns or under runs to the total Program cost. The Monte Carlo simulation model represents the summary of the logic and overall approach for the preparation of the Program cost estimate. The methodology establishes the major components of the estimate called "terms" such as construction cost, labor cost, support costs, and utilizes the estimate for these terms to establish a weighting for each for use in the simulation model. The project/operations activity team establishes the major elements of uncertainty in the estimate based upon knowledge of the work scope.

Based on the judgment of the project/operations activity team, a probability distribution is created for each of these elements of estimate uncertainty. On the basis of these probability distributions and the cost for the terms of the project/operations activity estimate, a Crystal Ball® simulation run is conducted to establish the cost estimate contingency at the appropriate percent (%) confidence levels.

5.7.2 Schedule Contingency

Schedule contingency addresses uncertainty within the CPB schedule baseline. Items addressed are schedule logic, activity durations, resource availability, planned work processes and schedule impact from T&PRA identified risks. A graded approach is applied to the development of schedule contingency.

System Plan Execution

Realizing that a schedule delay in NTB System Plan execution was generally non-recoverable and resulted in extending the program in the outyears, the approach to near-term impact assessment was to identify the additional cost of recovering from the realized risk such that System Plan execution could continue through the near-term. Near-term impacts are therefore cost impacts and contribute only to T&PRA cost contingency.

Collectively, projects/operations activities executing within the CPB can be delayed, however not all are on critical path to System Plan Execution. The individual project/operations activity calculated schedule contingencies were used to model a worst case critical path to the completion of CPB Program scope. The schedule contingency could then

be derived collectively for the CPB. This was not converted into a cost as it would be outside of the CPB window.

Congressional Line Item/Capital Asset Projects
For congressional line item/capital asset projects under execution or with execution imminent, schedule contingency was developed using a Monte Carlo technique with Primavera® (or equivalent) risk analysis software. Schedule impacts for contingency were developed with a range of durations analysis and a probabilistic branching modeling analysis. The range of durations analysis was developed using (Optimistic, Most Probable, and Pessimistic) duration impacts on each activity. The probabilistic branches used for analyses were defined from the risk registers developed in the T&PRA risk assessment within each specific project ROAR. The results of the analysis added probable schedule duration required to achieve an appropriate confidence level of completion. (For congressional line item/capital asset projects, a confidence level appropriate for the individual project may be selected). Contingency activities were added to milestones at the end of the project to allow for risk impacts that would extend the completion date by the impacted duration. Total cost impact associated with schedule contingency is added to the cost contingency estimate to account for the associated extension of time.

For future congressional line item/capital asset projects that will be executed within the CPB, for which no formal risk data was available, schedule contingencies were developed by the projection of historical data, parametrics and extrapolation.

Operations Activities
For operations activities, a graded approach was applied to develop schedule contingency based on their risk profile. This approach utilized multiple tools such as:

- Monte Carlo Technique
- Base on historical data on similar operations activities
- Perform and extrapolate parametric comparisons
- Enveloping monte carlo techniques
- Risk selection by top critical paths
- Expert judgement/Team consensus

5.7.3 T&PRA Contingency

System Plan Execution
As discussed in 5.7.2, the approach to near-term impact assessment was to identify the additional cost of recovering from the realized risk such that System Plan execution could continue through the near-term. Near-term impacts are therefore cost impacts and contribute only to T&PRA cost contingency. The T&PRA cost contingency estimate was developed based on the near-term residual risk impacts identified during the PBS-SR-0014 risk assessment (Appendix H). A cost probability distribution was developed for each risk using

Crystal Ball® software. The software was then used to statistically combine the distributions through a Monte Carlo process (random sampling methodology) to produce the T&PRA cost contingency estimate.

Congressional Line Item/Capital Asset Projects
For congressional line item/capital asset projects under execution or with execution imminent, T&PRA cost contingency was developed based on the residual risk impacts identified by the Team during the project risk assessment as documented in the individual project ROARs. Similar to the schedule risk data, the team developed residual probability and best, most likely and worst case impact cost during the project risk assessment for each discrete risk. A cost probability distribution was developed for each risk using Crystal Ball® software. The software was then used to statistically combine the distributions through a Monte Carlo process (random sampling methodology) to produce the T&PRA cost contingency estimate. The intent of the T&PRA cost contingency estimate is to identify the amount of contingency necessary for the Project at various confidence levels.

For future capital asset projects that will be executed within the CPB, where no formal risk data was available, T&PRA cost contingencies were developed by the projection of historical data, parametrics and extrapolation.

Operations Activities
For operations activities a graded approach was applied to develop T&PRA cost contingency based on their risk profile. This approach utilized multiple tools such as:

- Monte Carlo Technique
- Base on historical data on similar operations activities
- Perform and extrapolate parametric comparisons
- Enveloping monte carlo techniques
- Risk selection by top critical paths
- Expert judgment/Team consensus

5.7.4 Derivation of MR and Contingency

MR and contingency are derived from the combination of:

- Estimate Contingency
- Schedule Contingency
- T&PRA Contingency

For each of the above contingency categories, contributions from System Plan (Program) NTB execution and NTB project/operations activity execution are totaled at specific confidence levels to give a total MR and total contingency for the CPB.

Management Reserve (MR)

MR is defined as the cost and schedule contingency associated with Contractor risks (all risks except DOE-owned risks) calculated to achieve a specific confidence level (CL). For program and operations activities the MR confidence level is selected at 50%. For projects (congressional line item/capital asset projects), the MR confidence level is set as appropriate for each project. Therefore for the CPB MR is calculated from contractor risks as the sum of the following:

- Program NTB contingency (50% CL)
- Operations activity NTB contingency (50% CL)
- Project NTB contingency (at selected MR CL).

Contingency

Contingency (or DOE owned Contingency) is defined as the difference between selected MR CL and upper CL contingency for Contractor risks, plus the full cost and schedule contingency to achieve the selected CL for DOE owned risks. For program and operations activities the upper confidence level is selected at 80%. For projects (capital asset projects), the upper confidence level is set as appropriate for each project. Therefore for the CPB DOE contingency is calculated as the sum of the following:

- Program NTB and operations activity NTB contingency (80%-50% CL)(contractor risks)
- Project NTB contingency (upper selected CL - selected MR CL)(contractor risks)
- Program and operations activity NTB DOE contingency (80% CL)(DOE risks)
- Project NTB contingency (upper selected CL)(DOE risks)

5.7.5 Approximation of Outyear Contingency

By definition, outyear contingency is owned by the DOE and is the contingency necessary to complete the execution of PBS-SR-0014 outside the SRR contract period or NTB.

The major component of OPER impact is schedule impact. Risks realized during the near-term execution that force program completion extensions result in outyear schedule impacts. Risks realized during the outyear execution can result in both schedule impact and cost impact, although schedule impact is the major contributor to contingency.

The OPER contingency is therefore a schedule impact converted to cost with any additional cost impact added.

Application of modeling techniques consistent with those used for standard construction projects is appropriate for developing a model for PBS near term risk data; however, some complications arise, when using the same modeling technique for PBS out-year risk data. Four factors complicate the effectiveness of the application of a standard approach:

1. Concurrently Scheduled Activities - Although activities are individual and risk consequences are independent, the realization of risk events may result in a concurrent schedule delay which is additive, when converted to cost. For example, if two separate risk events 1) feed availability for SWPF and 2) the startup of SWPF were to have six-month delay consequences and both activities were scheduled for the same completion date, the net effect to the program should both risks be realized is a six-month delay. A standard analysis would count the impact twice in the model: once for feed delay and once for startup delay.

2. Common Consequences - When realized risks result in common consequences (e.g. two risks result in the consequence of building additional storage and do not increase the number of canisters being produced) the cost of the facility might be counted twice, if both of the risks occur during the modeling run.

3. Overlapping Consequences - The consequences of risks being realized may also overlap. This would be similar to concurrent consequences (e.g., two overlapping six-month delays may effectively result in a nine-month delay).

4. Model Response – Modeling results are representative of static conditions. The current lifecycle baseline is assumed an accurate depiction of future events, and PBS risk assessment results based on the current baseline constitute the basis of the data feed for the model run. These contingency estimates are restricted to outcomes predicted by the current baseline. In actual execution of the Program, flexibilities may minimize risk impacts, resulting in deviations from the modeled risk profiles representative of a static condition.

The model produced by the integration of all OPER PBS-SR-0014 risk data and the application of standard modeling techniques is extremely conservative and represents worst case scenario and a rough order of magnitude, i.e., no concurrent activities, common consequences, or overlapping consequences, and no benefit from model response are assumed. The resulting contingency is a “bounding contingency” and should be viewed as reasonably accurate for OPER purposes.

6.0 RESULTS

After completion of the update, the unmitigated active risks are comprised of 25 High risks, 36 Moderate risks and 56 Low risks. After the application of risk handling strategies, these were reduced to 6 High risks, 26 Moderate risks and 68 Low risks. A total of 17 risks were

avoided completely. The following, Table 10, is an inventory by risk group (defined in Table 9):

Table 10 – PBS-SR-0014 Risk Total by Risk Group

	Before RHS	After RHS
Group 1		
High Risks	6	4
Moderate Risks	13	5
Low Risks	23	26
Risks Avoided		7
Group 2		
High Risks	16	2
Moderate Risks	22	19
Low Risks	29	39
Risks Avoided		7
Group 3		
High Risks	2	0
Moderate Risks	0	1
Low Risks	2	1
Risks Avoided		2
Group 4		
High Risks	1	0
Moderate Risks	1	1
Low Risks	2	2
Risks Avoided		1

The PBS-SR-0014 ROMP Revision 6 (Reference 6) was used to develop the Contract Performance Baseline (CPB Revision 1) both for risk and for the calculation of MR and DOE contingency. Re-baselining of the CPB is not being performed with the issuance of System Plan Revision 20. As with System Plan revision 19, the formal change control process will be exercised to align the baseline incrementally with System Plan Revision 20 (changes to scope, MR, contingency, schedule etc.). This ROMP and risk data is forward looking to the completion of an alignment of the CPB with System Plan Revision 20 and provides data from which a comparison of the risk profile attributed to System Plan 20 can be compared against previous ROMP risk profiles. Also this ROMP provides the T&PRA contribution to MR and DOE contingency attributable to execution of a CPB aligned to System Plan Revision 20. This too can be compared to the previous ROMP data to achieve a measure of how adequate the existing reserves of MR and DOE contingency will be after incorporating System Plan Revision 20 changes into the CPB.

The following is a comparison between System Plan Revision 19 and System Plan Revision 20 execution for that portion of MR and Contingency derived from Program technical and programmatic risk:

Contribution of System Plan Execution T&PRA contingency to MR for System Plan Revision 19 execution = $58,701,000
Contribution of System Plan Execution T&PRA contingency to MR for System Plan Revision 20 = $98,712,000.

Contribution of System Plan Execution T&PRA contingency to DOE Contingency for System Plan Revision 19 execution = $337,421,000.
Contribution of System Plan Execution T&PRA contingency to DOE Contingency for System Plan Revision 20 = $64,780,000.

PBS-SR-0014 outyear contingency was calculated for System Plan Revision 19 at 80% as $4,032M. For System Plan Revision 20 execution the outyear contingency at 80% was calculated to be $8,435M. This provides a similar data to allow comparison between the risk profiles of current and previous System Plans for the outyears. These data points are conservative and should be considered the high estimate for the OPER.

The details of the System Plan Revision 19 execution contingency calculation are found within Reference 1. The details of the System Plan Revision 20 execution contingency calculation are found within Appendix H.

7.0 CONCLUSIONS

The Radioactive Liquid Tank Waste Stabilization and Disposition Program at SRS is essential to success of the SRS cleanup strategy. The program execution plan is aggressive and has significant levels of risk requiring implementation of risk-handling strategies. Of the high risks identified, five remain high after handling. The reduction of the other high risks is principally due to a combination of employing a strategic execution plan and execution of successful risk handling strategies.

Continuing active management and mitigation of risk is proving essential in limiting risk exposure within PBS-SR-0014 and remains an essential factor in minimizing the adverse impacts of uncertainties to the Program.

A comparison of near-term T&PRA based contingency contributions for System Plan Revisions 19 and 20 execution shows an increase in the overall SRR risk-based T&PRA contingency contribution ($59M to $99M), and a significant reduction in the DOE near-term contingency (from $337M to $28M). The increase in SRR risk-based T&PRA contingency contribution can be attributed to the addition of new emergent risks to the risk register and also the re-aligning of near-term to a five year window. The reduction in DOE near-term

contingency can be attributed to closing two major risks that were not realized and developing a successful strategy to avoid the impacts of a site utility outage:

- Waste Determination (WD) Approval Does not Support System Plan (266)-Closed
- Seismic Response Spectra Acceleration Values Increase (407)-Closed
- Site utility Outage-Avoided

A significant increase in outyear contingency was noted, from $4,032M to $8,453M. A comparison between System Plan Revisions in Table 11 shows changes in outyear contingency for the last five System Plan revisions relative to Program completion date. The significant increase between Revision 19 and Revision 20 System Plan OPER Contingency can be attributed to:

- Addition of a significant number of emergent risks (Refer to Section 5.2)
- Recent infrastructure failures which resulted in elevating the likelihood of existing equipment and infrastructure failure risks.
- Closure of a significant number of opportunities (Refer to Section 5.2)
- Integration of salt and sludge processing, which reduces the number of canisters, yet increases the impact of a sludge feed break which no longer is mitigated by using simulant.

Table 11 – Comparison of System Plan Execution Revisions 15 through 20

System Plan	End Date	Outyear T&PRA Contingency ($M)
Revision 15	FY2032	2,802
Revision 16	FY2026	4,942
Revision 17	FY2028	1,875
Revision 18	FY2033	2,695
Revision 19	FY2042	4,032
Revision 20	FY2041	8,453

SRR will manage System Plan Revision 20 execution by implementing the risk handling strategies identified within this ROMP and by focusing attention on continuous development of innovative handling strategies and facilitating benefits from identified opportunities.

7.1 PBS-SR-0014 RISKS

This risk assessment has determined a significant level of risk is associated with the Radioactive Liquid Tank Waste Stabilization and Disposition Program. Cost and schedule impacts associated with some of the risks, if realized, may be measured in billions of dollars

and years of schedule delays. Risk-handling strategies have been identified to combat these risks and are proving successful. Tools for use in prioritizing action items and risk handling strategies have been developed by the team for use by the Federal Project Director and contractors. Also the RMB has been established to ensure senior management overview of the Risk Management Program. These tools were demonstrated to be valuable and, effective in the management of risk, and will be maintained, and subject to continuing improvement.

Those risks related to external influences are outside the direct control of DOE-SR or contractor management, and as such RHSs tend to depend on stakeholder involvement and educating and reaching accord with key decision makers. RHS actions have been initiated on most of these risks; however they must be monitored closely to assure successful implementation.

The full implementation of RHSs results in a major reduction in overall risk level, Recommendations for near-term risk management are discussed in Section 6.4. Successful execution will result in lowering the near-term risk level and will also provide risk reduction for the outyear.

Residual High Risks

After the application of these RHSs, six high risks remain:

- Risk 027 – Being able to adequately fund PBS-SR-0014 throughout its life cycle to permit full execution of the System Plan is uncertain. This risk is a crosscutting risk for both major contractors at SRS and will be handled at the site level.
- Risks 011, 204 and 295 – The System Plan end date places significant stress on what will be an increasingly aging infrastructure. Recent infrastructure failures provide an insight into the problems that may be encountered with operating the HLW System for an additional 24 years.
- Risk 090 – The capacity of the existing Tank Farm infrastructure will be stretched close to its limits in supporting salt batch preparation. Choke points could easily be encountered if multiple use conflicts develop and planned availability of transfer routes and equipment are impacted.
- Risk 472 – Imposing controls on operations projects/activities similar to those required for congressional line item/capital asset projects results in significantly extending project/activity durations, increasing overall cost and impacting System Plan execution.

Federal Facilities Agreement (FFA)

A specific "placeholder" risk has been added for failing to meet FFA requirements for tank closure. System Plan 20 shows that of the 24 old-style tanks (types I, II and IV): 7 tanks are already closed; of the remaining 17 tanks, 16 will undergo closure after their FFA milestone dates; and 11 tanks will miss their associated BWRE milestone (this risk has already assumed

to have been realized for those milestones shown as not being met in System Plan Revision 20). A risk exists that due to realizing one or more of the risks relating to tank closure, (identified within this risk register), tank closure or BWRE milestones are are further delayed past FFA milestones. A similar condition and risk exists for Site Treatment Plan milestones.

There are multiple risks relating to tank closure, impacting the Program which adversely impact the ability to meet the remaining BWRE and tank closure milestones. Though the impact to the final Program completion date may not be significant, fines imposed for failure to meet regulatory commitments can be considerable. Fines imposed by the State of South Carolina and paid by DOE are not included in assessment of financial impact to the Program and are assumed to be external to the Program cost baseline For this reason, Risk 391 serves to communicate a status and level of concern relative to achieving the remaining FFA commitment dates and realizing further delays against those projected to be missed. This specific placeholder risk is not included in the total number of risks, nor does it contribute to contingency. Of the four most significant risks contributing to missing the remaining FFA milestones, two, namely "Program (PBS-SR-0014) Funding Impacted by Competing Priorities" (Risk 027) and "SWPF Not Available When Planned" (Risk 205), are outside SRR control.

7.1.1 Risk Categories

A profile of mitigated risk levels for each Category is shown in Table 12:

Table 12 – PBS-SR-0014 Mitigated Risk Level Distribution by Category

Risk Category Number	Risk Category Title	High	Moderate	Low	Zero (Avoided)
1	Design	0	0	2	1
2	Regulatory and Environmental	0	1	7	2
3	Resources/Conditions	1	2	6	1
4	Safeguards and Security	0	0	0	0
5	Technology	0	0	3	0
6	Procurement	0	0	0	0
7	Construction Strategy	0	0	1	0
8	Testing	0	0	0	0
9	Safety	0	2	5	0
10	Project Integration / Interfaces	2	3	3	7
11	Management	0	0	0	1
12.1	Process Performance – Flowsheet Issues	0	14	34	5
12.2	Process Performance – Equipment/Infrastructure Failures	3	4	7	0

The risk profiles for populated categories are described as follows:

Design (1): Risks relating to being able to implement a design or modification (e.g a planned design is not cost-effective or feasible). The risks in his category are low, the highest being a potential for beyond design basis requirements to be imposed based on external events.

Regulatory and Environmental (2): Risks relating to Federal, State and local stakeholder actions such as external legislative changes, lawsuits and stakeholder approval such as permitting and licensing. Also risks relating to changes in Standards and Codes, Regulatory requirements (e.g. Safety Basis requirements, etc.). A major risk in this area is not being allowed to make temporary use of old style tanks. Additionally, the placeholder risk of missing an FFA BWRE or tank operational closure commitment is a high visibility risk within this group.

Resources/Conditions (3): Risks relating to resources such as tank space, material/equipment availability etc. The highest risks evaluated in this category relate to funding and analytical resources:

- Funding Priorities within Federal Budgetary process could change resulting in impacts to funding availability for PBS-SR-0014. This could result in delays to program completion, resulting in additional environmental and programmatic risks and life cycle costs.
- The outyear plan requires more samples to be analyzed in parallel than can currently be performed by SRNL. If SRNL cannot increase capacity to analyze samples tank closure, salt batch qualification and/or sludge batch qualification will be impacted.

Safeguards and Security (4): Risks relating to establishing controls for safeguarding of information and physical assets. No Program level risks have been identified in this category.

Technology (5): Risks relating to the technical uncertainties such as deployment of new or modified technology or new applications of existing technology. The highest risk in this category relates to new technologies being deployed for tank cleaning. If these first of a kind technologies do not perform satisfactorily, tank closure will be directly impacted and alternate technologies would have to be identified and matured for deployment.

Procurement (6): Risks relating to procurement of materials and/or services. No Program level risks have been identified in this category.

Construction Strategy (7): Risks relating to construction of major projects. One risk was identified in this category relating project delays impacting the availability of SDU 6.

Testing (8): Risks relating to testing of facilities, equipment, and processes. No Program level risks have been identified in this category.

Safety (9): Risks relating to unforeseen costs and schedule delays necessary to implement new or maintain existing safety requirements before and during deployment. Risks in this category include:

- DOE direct SRR to update dispersion characteristics reflecting latest information resulting in widespread revision of accident analysis calculations, upgrading of existing controls to safety and addition of new safety class controls to facilities and SSCs.
- DOE Requires DWPF AB Update to Latest STD (3009) Based on Number/Significance of Changes.

Project Integration / Interfaces (10): Risks relating to the effects of internal project/operations activity delays, issues between prime contractors on WSDP projects/operations activities and issues with other Federal Organizations (e.g. the NNSA or the DOE office responsible for the Federal Repository Project). The highest risks in this category include:

- DOE direction to impose congressional line item/capital asset project controls on operations projects/activities.
- DOE direct additional Pu materials to SRS for disposition which challenges challenge the 897g/m3 total fissile material limit, Federal Repository LA and/or impacts the ability to produce canisters at 40% waste loading.
- The inability of the Tank Farm infrastructure to support salt processing operations (SWPF feedbatch preparation, etc). A reduction in throughput or delay in processing can directly impact the Program end date.
- Being unable to manitain the highly integrated and complex schedule of concurrent activities within the Tank Farms. These impacts would slow down the overall execution of the System Plan.

Process Performance – Flowsheet Issues (12.1): Risks relating to process impacts resulting from unexpected material and chemical balance issues between interfacing facilities. Also risks relating to the effects of unanticipated variances in established or projected waste characterization data such as the presence of rogue constituents, differing primary compound concentrations and the targeted sludge inventory within specific tanks. Major risks include: impacts of unexpected variances of Chemistry/Rheology of Sludge Waste Feed Chemistry on DWPF operations; disposition of mercury and oxalates in the HLW flowsheet; titanium loading in DWPF glass; and the impact on throughput of close-coupling major facilities, DWPF, ARP/MCU, SWPF, and SPF/SDF. Other risks include those relating to the deployment of DWPF process improvements and the deployment of NGS solvent,

Process Performance – Equipment/Infrastructure Failures (12.2): Risks relating to equipment and infrastructure failures (e.g. DWPF Melter, DWPF infrastructure, HLW Tank leak, Evaporator pot, Saltstone Facility equipment, pumps, transfer lines etc.). The highest risks evaluated in this category are transfer line failure, Tank Farm infrastructure and utilities failure, DWPF equipment failure and damage to replacement melter(s) during storage/assembly

Within above the categories, risks can be either internal to PBS-SR-0014, crosscutting at site level or interfacing between PBSs or the complex. These risks are discussed in Section 7.2.

7.2 INTERFACING AND CROSS-CUTTING RISKS

Interfacing risks with other PBSs (e.g. H-Canyon [PBS-SR-0011/12]), are internal interface risks and those with an external entity (e.g. the Federal Repository), are external interface risks. With the exception of delays to the overall completion of PBS-SR-0014 which impact PBS-SR-0013 and 30, (generally all the PBS-SR-0014 risks), interfacing risks that could impact other PBSs are identified as such on the individual ROAFs. Risks that may impact all SRS PBSs are termed cross-cutting risks.

With few exceptions, all the risks within the PBS-SR-0014 scope result in delaying the

program turnover to PBS-SR-0013 and 30. It is recognized that some facilities may be turned over earlier (e.g. F-Area Tank Farms) and that other facilities may be delayed towards the end of the program (e.g. DWPF and SWPF). The System Plan does not at this time include shipment of canisters to a federal repository, however this will have to occur prior to complete turnover to PBS-SR-0013 and 0030.

Multiple risks exist throughout this ROMP which could result in an inability to receive waste from H-Canyon. Generally, realizing these risks would use up tank space and therefore provide limited storage volume for this incoming waste stream. All risks potentially impacting receipts from H-Canyon are identified on their individual ROAFs.

Interfacing and crosscutting risks and opportunities included in this ROMP and are shown in Table 13:

Table 13 – PBS-SR-0014 Crosscutting and Interfacing Risks and Opportunities

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
12	DWPF Equipment Failure (excluding Melter)	Interface Risk: DOE-SR SWPF Line Item Project	A risk exists that failure of DWPF equipment e.g. SME, could result in halting DWPF operations. To handle this risk for PBS-SR-0014: The current program replenishes assembled unit spares, revalidates present list of equipment identified to be maintained as spares and verifies that minimum quantity of spares are maintained on hand and procured as needed, however, reduced funding levels may impact these activities (see risk 027). The procurement of spares will be "elevated" to establish visibility and ensure correct prioritization of funding is maintained. In addition to these already established programs, system life extension will be investigated. Failure analyses are being performed on failed equipment to identify solutions to any weaknesses in design. Incorporate lessons learned to increase longevity of components. This interface risk exists for the first year of SWPF operations (prior to turnover to long-term operator).

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
18	Saltstone Processing Facility (SPF) Cannot Achieve Attainment	Interface Risk: DOE-SR SWPF Line Item Project	Attainment of SPF is predicted and used to establish System Plan processing goals. A risk exists that equipment failure(s) or process upsets impact processing. To handle this risk for PBS-SR-0014: Currently performing system health evaluations and ensuring adequate spare parts/equipment are identified and on hand to support facility operations is part of ongoing operations. The procurement of spares will be "prioritized" to establish visibility and ensure correct prioritization of funding is maintained. Investigation of methods to mitigate the impact of a Saltstone unplanned outage has been performed and the integration of facilities response to a SPF outage is an ongoing process. In addition to these already established programs, an improved system health program has been implemented. Performed investigation, evaluated and recommended improvements to achieve enhanced capacity and reliability (Enhanced Low Activity Waste Disposal - ELAWD Phase 2). This interface risk exists for the first year of SWPF operations (prior to turnover to long-term operator).

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
027	Program (PBS-SR-0014) Funding Impacted by Competing Priorities	Crosscutting Risk: All PBSs	The Program life cycle is based on having the funding available when needed. Underfunding and/or untimely funding of PBS-SR-0014 results in delays to Program completion, resulting in additional environmental and programmatic risks and life cycle costs. Additional near-term costs are incurred in re-establishing procurement cycles for projects/operations activities placed on hold due to funding shortfalls. Significant costs will be incurred due to demobilization and remobilization of the skilled workforce as projects are de-staffed and placed on hold to be later re-started. To handle this risk for PBS-SR-0014: Funding is requested with significant justification (including consequences of not executing operations activities and projects) to support operations activities and projects, communicate impacts if early funding is not available and monitor change after receiving funding. SRR currently develops funding strategies to support meeting the System Plan. System Plan adjustments are identified to compensate for funding shortfalls. If it is determined adjustments are required, the System Plan will either be revised or projects/operations activities will be extended (if possible) or cancelled. Execute cost savings initiatives (iACT) and schedule approved initiatives in P6 for execution. Established Mission for Excellence Group to use lean tools to identify improvements in execution processes (e.g. VSA, RIE). This is a Cross-cutting risk owned by DOE. It is a site level risk, and should be reviewed during the FRMP update for ownership by DOE-HQ.

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
030	3H Evaporator Material and Chemical Balance Issues	Interface Risk: PBS-SR-0011/0012.	The 3H Evaporator supports DWPF sludge batch preparation, H-Canyon and tank closure. Unknown feed components or unexpected constituents could be in evaporator feed which results in a reduction in evaporator performance and subsequent decrease in space recovery versus what is assumed in the baseline. Canyon effluents could be restricted. To handle this risk for PBS-SR-0014: Currently an Evaporator Feed Qualification Program is employed to mitigate this event. Transfer Plans include evaporator transfers and are maintained current, change controlled, and approved by facility management. Additionally, the current Program gathers experience gained from previous sludge batch preparations (e.g. risk assessments/mitigation, sludge washing strategy) and incorporates this into planning of the next sludge batch. Any new missions run by H-Canyon would be characterized, evaluated and approved through a formalized WAC process. A realistic salt evaporator model has been developed, however it has not, as yet, been implemented. This is an interface risk with Canyon operations and PBS-SR-0011 and 0012.

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
040	Salt Dissolution Results in the Precipitation of Gibbsite	Interface Risk: DOE Office(s) responsible for the Federal Repository Project	Saltcake solids consist primarily of sodium salts including nitrate, sulfate, phosphate, aluminate, and oxalate. The baseline dissolution process uses flushwater (FW) or inhibited water (IW) to dissolve the saltcake. As the dissolution progresses to the bottom of the tank, the soluble salts, primarily sodium hydroxide, become progressively less concentrated, resulting in a thermodynamic solubility shift from sodium aluminate to gibbsite, i.e., gibbsite precipitates. The precipitated gibbsite accumulates as a heel in the dissolution tank or deposit in the dissolved salt receiving tank. This material will enter the feed stream to SWPF and ARP/MCU and result in being transferred to DWPF as solids in the MST slurry. Precipitated gibbsite in the heel will be transferred to DWPF as part of a sludge batch resulting in additional canisters being produced. To handle this risk for PBS-SR-0014: Methods to avoid the precipitation of gibbsite, as well as other aluminum salts, and their impacts to SWPF feed flow sheets have been evaluated. Due to the strategy and cost that would be required to remove gibbsite verses normal salt dissolution, it was determined that inclusion in flow sheets was not warranted at this time. Alternatively, the sludge batches can be blended to account for the additional aluminum content from SWPF and ARP/MCU. Investigate the use of aluminum dissolution for the removal of gibbsite. Currently, as part of the ARP/MCU program, the use of caustic addition is being evaluated for use on a batch by batch basis. This is an interface risk with the DOE Office(s) responsible for the Federal Repository Project.

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
70	Rogue Constituents in Salt Feed	Interface Risk: DOE-SR SWPF Line Item Project	The solvent extraction and actinide removal process in SWPF is assumed to be successful given the expected waste constituents. A risk exists that unknown and unexpected constituents affect these processes and their throughput is adversely impacted. To handle this risk for PBS-SR-0014: As part of the current program, significant differences between future tanks and tanks tested to date are identified. As part of the salt feed qualification, bench scale tests on real waste will determine if impacts to processing will be realized. Additional risk handling strategies: Obtain processing data from ARP/MCU operation to be used in process planning for SWPF; Perform real waste testing for SWPF if ARP/MCU results indicate the potential for a problem. Evaluate the need to perform real waste sampling/testing on source tanks to prevent encountering issues during batch qualification. A window has been provided in salt batch preparation planning for transfers, sampling, analysis and qualification. This interface risk exists for the first year of SWPF operations (prior to turnover to long-term operator).
084	Lack of Dispositioning of Failed Equipment Impacts DWPF Operations	Interface Risk: PBS-SR-0030	Failed canyon equipment is stored on cell covers as a temporary measure until a disposition path is found. The lack of disposition path options results in build-up of equipment inventory in temporary storage. Operations within the DWPF canyon require periodic movement of this equipment to gain access to cells. A risk exists that these additional evolutions directly impact DWPF operations. To handle this risk for PBS-SR-0014: 1) Review lessons learned from SME / Melter Replacement Outage; 2) Identify equipment to dispose as LLW; 3) Identify equipment to dispose as HLW; 4) Evaluate disposal options (cut up with shear / existing storage boxes / new storage boxes). Use of bubblers (and partial replacement), providing additional storage facilities and cutting up discarded jumpers (as far as practical) is underway. BROKK unit has been procured but has not been deployed. Limited temporary shielded storage has been provided. For final disposition of failed equipment, this risk is an interface risk with PBS-SR-0030.

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
090	Tank Farm Tank Availability and Infrastructure Does Not Support Salt Processing Operations	Interface Risk: DOE-SR SWPF Line Item Project	Tank Farm waste tank availability and associated infrastructure (IW System for Waste Removal, slurry pumps, dedicated transfer lines, etc.,) do not support the ability to prepare salt solution to feed the Salt Processing Facilities (ARP/MCU and SWPF) at planned processing rates. To handle this risk for PBS-SR-0014: Enhanced modeling techniques are being employed to analyze time and motion of transfer and feed preparation strategies. From this modeling, the need for modifications to infrastructure can be identified and prioritized as appropriate. This interface risk exists for the first year of SWPF operations (prior to turnover to the long-term operator)
091	Close Coupling-SWPF, DWPF, ARP/MCU and SPF Limits Waste Processing Throughput (Non-Chemistry)	Interface Risk: DOE-SR SWPF Line Item Project	The operations of SWPF, DWPF, and SPF (including SDUs) are closely coupled. (Also for a limited period, DWPF and ARP/MCU). The planned or unplanned shutdown of DWPF may affect the operation of SWPF due to limitations in lag storage for strip effluent. The planned or unplanned shutdown of SPF may also affect the operation of SWPF, however a larger DSS lag storage capacity is available via Tank 50 and will be in the future with the Salt Solution Receipt Tanks (SSRTs) at SPF. To handle this risk for PBS-SR-0014: COREsim modeling has been performed on several major areas of the LWO system and additional modeling will be performed to include ARP/MCU and help identify potential “fixes” to support a higher waste processing throughput. Facilities will maximize the use of redundancy, spares and predictive maintenance. Facilities will closely coordinate planned outages. Implementing modifications to DWPF (e.g. alternate reductant, TiO2 testing, maximum Cs canister content and water reduction modifications), SPF (e.g. SSRTs and increasing shift coverage). This interface risk exists for the first year of SWPF operations (prior to turnover to long-term operator).
149	HLW Tank Leak Requires the Use of Contingency Space	Interface Risk: PBS-SR-0011/0012	A risk exists that a waste tank leak develops in a compliant or type IV tank being used to store or process radioactive material that requires the use of tank farm contingency space (1,300,000 gallons) This could prohibit transfers from H-Canyon to the Tank Farm. To handle this risk for PBS-SR-0014: Salt processing is planned to achieve space gain and tank chemistry control programs prevent tank conditions that facilitate leak development. This is an interface risk with PBS-SR-0011/0012.

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
175	Canyon Waste Contains Rogue Constituents	Interface Risk: PBS-SR-0011/0012	A maximum of 300,000 gallons of waste each year will be received from the Canyon for storage in the Tank Farm (currently Tank 39). The characterization of this waste is planned to be compatible with Tank Farm storage, concentration and processing by downstream facilities. A risk exists that a constituent of concern is identified during characterization of this waste stream. This constituent makes the waste stream unacceptable for receipt by the Tank Farms (e.g. incompatible with Tank Farm storage, concentration and processing by downstream facilities). Waste acceptance by the Tank Farms would not be allowed to continue until an alternate storage, concentration or processing strategy could be developed. To handle this risk for PBS-SR-0014: As part of ongoing program activities a system impact analysis methodically examines the potential impacts of all waste received to downstream processing facilities. New missions within the Canyon creating new waste streams would result in the need to revise contractor agreements with DOE. This is an interface risk with PBS-SR-0011/0012.
176	Volume of Canyon Waste is Greater Than Planned	PBS-SR-0011/0012	After 2017, up to 300,000 gallons of waste each year is planned to be received from the Canyon for storage in the Tank Farm through 2025. Additional output (longer duration or higher annual waste volume) could be produced by the Canyon. Additional volume uses tank space and creates more material to be processed. To handle this risk for PBS-SR-0014: The volumes of waste to be received from the Canyon is a Memorandum of Understanding based agreement (FSA) and a baseline change would be required if they were to change.. This is an interface risk with PBS-SR-0011/0012.
197	DWPF Transfer Line Failure	Interface Risk: DOE-SR SWPF Line Item Project	DWPF transfer lines will be used for the next 22 years. No spare line is available. This risk involves the failure of one of the lines (core or jacket). This would result in DWPF downtime until a repair or alternate path is provided. To handle this risk for PBS-SR-0014: This risk is considered acceptable as 20 years of operations have been performed without any indication of line degradation. Programs are currently in place to perform inspections and maintenance.. This interface risk exists for the first year of SWPF operations (prior to turnover to long-term operator).

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
205	SWPF Not Available When Required (DOE Risk)	Interface Risk: PBS-SR-0011/0012, DOE-SR SWPF Line Item Project	The System Plan (Revision 20) identifies SWPF as beginning operation in December, 2018. A risk exists that the project may encounter delays and be unavailable for operation as planned. The worst case assumes a 22 month delay in the startup of the SWPF. To handle this risk for PBS-SR-0014: The management of the EPC contract is being performed by DOE-SR and handling of risks that may challenge the startup date of SWPF is the responsibility of DOE-SR. The DOE Federal Project Director will continue to monitor EPC contractor performance against the baseline schedule. The EPC contractor has developed a risk management plan for the SWPF project and is currently implementing the plan to handle these risks. Contract mechanism has been modified to incentivize construction complete (Milestone of December 2016 has been incentivized to an early completion in April 2016) and also to share schedule and cost risk with the EPC. Additional risk handling strategies are directed at maintaining the program completion milestones by extending operation of ARP/MCU through or beyond 2020. This is a an interface risk with the DOE-SR SWPF Line Item Project.
214	Compliance Assessment Data Conflicts With Assumptions Upon Which 3116 WD is Based	Interface Risk: PBS-SR-00030/40	Data gathering and evaluation of data to ensure ongoing compliance with 3116 WD assumptions is being performed for Salt Waste Disposal, and both FTF and HTF closure activities. A risk exists that data will be found to invalidate assumptions used as a basis for the applicable 3116 WD. Processing, disposal and/or closure activities will be halted until issues are resolved. To handle this risk for PBS-SR-0014: This risk is accepted based on the established process of review and discussion of assumptions by all parties. This process ensures that assumptions are clearly understood.. This is an interface risk with PBS-SR-00030/40 for construction of a different closure cap design.

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
290	Interface Requirements With Contractor Do Not Support Integration of SWPF	Interface Risk: DOE-SR SWPF Line Item Project	The integration of SWPF into the HLW System requires multiple technical and programmatic interfaces to be executed. A risk exists that interface requirements between contractors do not support timely and efficient integration of SWPF with the HLW System.. To handle this risk for PBS-SR-0014: These risks are identified and managed within the SWPF Federal Project Risk Management Plan and within SRR Risk and Opportunity Management Plan(s). SRR actions include: Continuing to execute the current interface process to address interface design requirements early; Continuing involvement with SWPF design reviews; Performing CoreSim modeling to evaluate pinch points; maintaining the existing dedicated team to enhance the interface with SWPF and to ensure that all scope within Liquid Waste that is needed to support SWPF startup is coordinated and integrated to ensure timely startup and continued uninterrupted SWPF operation. SWPF Federal Project actions are documented within V-RMP-J-00001 and managed under the Federal Project Risk Management Plan. Develop a detailed integrated schedule for SRR support of SWPF tie-in, testing and startup. Additional actions under this PBS-SR-0014 ROMP are limited to ensuring salt processing capabilities should this risk be realized. Created a schedule integration team (Parsons, SRR and DOE) to focus on interface points and integration issues. Assign dedicated SRR startup resources to SWPF startup team as requested by SWPF FPD. This interface risk exists for the first year of SWPF operations (prior to turnover to long-term operator).

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
295	Tank Farm Transfer Line Failure	Interface Risk: DOE-SR SWPF Line Item Project and PBS-SR-0011/0012	Transfer lines within the Tank Farms are over 30 years old (some are approaching 60 years old) and will be relied upon to be functional for another 25 years. These lines will be necessary for processing of tank contents, salt feed preparation and tank cleaning activities. A risk exists that a line needed for one of these activities degrades to the extent that it becomes unserviceable and cannot be used as required. To handle this risk for PBS-SR-0014: Monitoring specific transfer line health and developing tailored inspection and maintenance activities as part of the ongoing program. Investigate transfer line alternatives (hose in hose) and develop approved guidelines as to when they can be deployed. Investigate with regulators the limited use of degraded secondary containment for transfers. (case by case risk-based evaluation). This is an interface risk with the DOE-SR SWPF Line Item Project and PBS-SR-00011/12.
297	Infrastructure Modifications are not Completed when Required to Support SWPF Startup	Interface Risk: DOE-SR SWPF Line Item Project	SWPF is planned to begin operations in December 2018. Modifications to the site infrastructure must be completed prior to December 2018 to support Authorization to Operate (ATO). A risk exists that these infrastructure modifications cannot be completed to support SWPF startup. To handle this risk for PBS-SR-0014: If necessary, the SWPF tie-in outage work will be planned with a 24/7 work schedule to remove the schedule variance and executed on that basis as necessary. Develop a detailed integrated schedule for SRR support of SWPF tie-in, testing and startup. Perform RIE(s) to reduce needed outage window and implement recommendations. Scope is being implemented with approximately 1 year buffer to ATO.This is an interface risk with the DOE-SR SWPF Line Item Project.

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
299	Tank Leaks to Environment During Tank Cleaning Step	Interface Risk: PBS-SR-00030/40	During Tank closure activities, waste tanks will be cleaned with water, caustic, and/or acid to remove residual material. A risk exists that during cleaning, a leak develops and releases material through the containment to the environment. To handle this risk for PBS-SR-0014: Maintain liquid levels as low as practical during cleaning. Use lower chemical concentrations and limit acid residence time. Implement staged contingency transfer system per operations plan; Avoid risk on single wall (Type IV) tanks by not performing acid cleaning in these tanks. Developing technology to perform enhanced mechanical cleaning is an ongoing activity. For tanks evaluated as being susceptible to corrosion failure, design and install annulus transfer capability prior to tank cleaning. As lessons are learned relative to the potential impacts of chemical cleaning with limited concentrations, utilize them to establish acceptable thresholds for chemical cleaning. This is an interface risk with PBS-SR-00030/40 which would have additional scope to perform for final closure which may have to be initiated early to satisfy regulators.
366	More Pu is Required to be Dispositioned in Sludge Batches	Interface Risk: DOE Office(s) responsible for the Federal Repository Project and PBS-SR-0011/0012	Currently Pu disposition is planned at a rate that will not challenge the 897g/m3 total fissile material limit, Federal Repository LA or impact the ability to produce canisters at 40% waste loading. A risk exists that DOE will direct additional Pu materials to SRS for disposition. To handle this risk for PBS-SR-0014: The disposition of additional Pu will be a System Plan change and the PBS baseline will undergo change control to include the additional scope which essentially avoids impact by triggering baseline change control. There is no residual risk or contribution to contingency from this risk. As additional canisters will be produced, this is an interface risk with the DOE Office(s) responsible for the Federal Repository Project and PBS-SR-0011/0012.

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
384	Develop Approved Final Disposal Paths for DWPF Failed Equipment (Opportunity)	Interface Opportunity: PBS-SR-00030	Currently at DWPF, failed Melters and failed equipment are stored in boxes within underground Failed Equipment Storage Vaults (FESVs). As equipment fails, more FESVs are built to provide additional storage. None of the stored equipment is being disposed of at this time. An opportunity exists to develop a path to final disposition for failed equipment and avoid the need to construct additional FESVs. To handle this opportunity for PBS-SR-0014: Evaluate this opportunity as an inter-PBS opportunity. By allowing the final disposition early, the life cycle of the final SRS closure PBS (30) would be reduced. Review possibility of dispositioning DWPF Melter in a prequalified transportation box as LLW. This is an interface opportunity with PBS-SR-00030.
385	Re-Define Final Vitrified Wasteform Requirements (Opportunity)	Interface Opportunity: DOE Office(s) responsible for the Federal Repository Project	Glass wasteform requirements were developed through integrating projected DWPF glass wasteform characteristics (e.g. waste loading) with the permitting of Yucca Mountain as it related to pre-closure and post closure. It is no longer planned to utilize Yucca Mountain as the Nation's HLW Federal Repository and subsequently the Project has been cancelled. An opportunity exists that the requirements of Yucca Mountain may no longer need to be imposed on the DWPF Wasteform. A set of new DWPF Glass wasteform requirements could be developed (e.g. a greater fissile waste loading) which optimize production and balance the maximum throughput of DWPF against the ability to pretreat waste within the HLW System. To handle this opportunity for PBS-SR-0014: Develop a business case for the glass wasteform by establishing higher fissile waste loading, Ti limits, Al concentration, etc. Gain acceptance of DOE-HQ and applicable government office. This is an interface opportunity with the DOE Office(s) responsible for the Federal Repository Project.

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
388	Analytical Resource Limitations Prevents Meeting Baseline Schedule	Interface Risk: PBS-SR-00030	Currently tank samples are analyzed by SRNL in the High Activity Cells. Outyear baseline schedule requires more samples to be analyzed in parallel than can currently be performed by SRNL. A risk exists that SRNL cannot increase capacity to analyze samples within cost and schedule constraints and meet the baseline for tank closure, salt batch qualification and/or sludge batch qualification. To handle this risk for PBS-SR-0014: Determine adequacy of existing SRNL capabilities and define requirements through approval of Liquid Waste Tank Residual (LWTR) Sampling Assurance Program Plan (SAPP) and LWTR Quality Assurance Program Plan (QAPP) (striving to align requirements with existing capabilities). Look for cost effective alternative to levelize the sample analysis need (e.g. SWPF, MOX). Develop through sample data (established in the earlier tank closures), a less extensive sampling requirement which eases the pressure on laboratories. Once the capability has been maximized, adjust the system plan to match the capability. This risk will be avoided once capability has been verified. This is an interface risk with PBS-SR-00030.
394	New Waste Stream to Tank Farms (DOE Risk)	Interface Risk: PBS-SR-00011/12	The System Plan is based upon the current waste inventory and identified influents from the Canyon. A risk exists that a new mission of the Canyon produces an entirely new waste stream (not simply a change to an existing flowsheet) for processing and stabilization. To handle this risk for PBS-SR-0014: The existing program has processes in place to evaluate new waste streams and downstream impacts to waste processing. The Liquid Waste program has a Memorandum of Understanding based agreement (FSA) and a baseline change may be required if a new waste stream were introduced. This is an interface risk with PBS-SR-00011/12.
401	Exec. order (#13514) Requires Facilities Reduce Greenhouse Gasses	Crosscutting Risk: All PBSs	As SRS may be considered as one facility, new SRS facilities such as MOX and SWPF may add to total greenhouse emissions. This may impact the balance of total emissions, thereby placing restrictions on new processes. To handle this risk for PBS-SR-0014: It is not considered credible that this risk will impact the PBS-SR-0014 Program, however it may impact other activities at SRS. To avoid this risk entirely, it has been raised to a site level for handling.

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
402	Beyond Current Design Basis Requirements Imposed	Crosscutting Risk: All PBSs	Currently DOE Orders and National Consensus Codes and Standards are used to establish a design basis and code of record for SRS SSCs. A risk exists that external influences result in a change to DOE orders or National Consensus Codes and Standards. To handle this risk for PBS-SR-0014: Beyond design basis evaluations have been performed for Tank Farms and are planned for DWPF. Minor DSA changes were implemented for the Tank Farm which increased the robustness of the saftey basis. This is a crosscutting risk with all PBSs.
426	Acidic Chemical Cleaning is Required on Non-Sludge Solids Tanks	Interface Risk: DOE Office(s) responsible for the Federal Repository Project	System Plan 20 assumes that other than the source tanks for sludge solids, acidic chemical cleaning will not be required prior to closure. A risk exists that mechanical cleaning (mixing) alone is not sufficient, and some of these tanks require acidic chemical cleaning. This will result in an additional number of canisters being produced. To handle this risk for PBS-SR-0014: Develop a position on the effectiveness of acidic chemical cleaning with respect to mechanical cleaning. Use this position to minimize the number of source tanks for sludge solids tanks that would have to undergo chemical cleaning as opposed to extended mechanical cleaning should issues arise with meeting tank cleanliness requirements. This is an interface risk with the DOE Office(s) responsible for the Federal Repository Project.
431	No Disposal Path Exists for Spent Solvent from SWPF	Interface Risk: DOE-SR SWPF Line Item Project	Currently the disposition path for SWPF spent solvent has been defined in the ICD as being disposed of by the Liquid Waste Contractor (SRR), this however is limited to only 20-50 gals of radioactive/hazardous waste. A risk exists that the final disposal of spent solvent is complex and requires further treatment of the spent solvent. This could prevent SWPF from exiting ORR. To handle this risk for PBS-SR-0014: Perform analysis of solvent waste to better characterize waste (SWPF Project). Finalize solvent waste disposition path forward for lifecycle of SWPF. This is an interface risk with the DOE-SR SWPF Line Item Project.

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
445	Scope to be Added to PBS-0014 Due to Dispersion Characteristics Change is not Defined (DOE Risk)	Crosscutting Risk: All PBSs	SRR has been directed to update dispersion characteristics reflecting latest information. The impact of this update is unknown. No allowance for this change is provided for in the current baseline. This risk provides a vehicle for accounting for the uncertainty of the impact of this scope addition. To handle this risk for PBS-SR-0014: SRR will perform upfront studies and will work closely with DOE to minimize the impact of this change. This is a crosscutting risk with all PBSs.
451	Site Utility Outage (DOE RISK)	Interface Risk: DOE/Ameresco and M&O for Site Utilities	SRR relies upon site infrastructure, and the ability of the M&O and DOE/Ameresco to provide reliable utility services e.g. steam, electrical power, domestic water, fire water, well water (process water), sanitary sewers, roads, rail etc. A risk exists that a utility service becomes non-operational and Liquid Waste is without that service until it is restored. DOE/Ameresco will avoid the risk of steam supply failure at a site level with the addition of a redundant biomass plant and non-co-located package boiler. To ensure reliable infrastructure is maintained in response to PBS needs, SRR will incorporate lessons learned actions resulting from analysis of the January 2014 steam outage event. Table top drill has been performed. This is an interface risk with DOE/Ameresco and M&O for Site Utilities.
462	Increased Aluminum due to Aluminum Dissolution Creates Precipitation During Processing	Interface Risk: DOE-SR SWPF Line Item Project	Aluminum dissolution will be performed to reduce mass to be vitrified (minimize number of cans). A risk exists that the additional aluminum precipitates out during salt processing at SWPF. To handle this risk for PBS-SR-0014: Maximize aluminum in salt feed to allowable soluble Al in the salt batch; and add hydroxide (within Tank Farm or SWPF) prior to processing . These handling strategies should be worked in conjunction with handling strategies for Risk 251. These handling strategies should be worked in conjunction with handling strategies for Risk 251. This interface risk exists for the first year of SWPF operations (prior to turnover to long-term operator).

ID	Risk/Opportunity	Cross-Cutting/ Interfacing	Description/Handling
467	Oxalates Impact Salt Processing	Interface Risk: DOE-SR SWPF Line Item Project	Oxalates are present in stored waste and are also being introduced into the system as part of cleaning operations (tanks and 512-S filter). A risk exists that the level of oxalates in salt feed are high enough to promote precipitation of oxalate solids during processing. To handle this risk for PBS-SR-0014: Minimize oxalate use, i.e. 512-S filter cleaning and tank cleaning. Use an ion exchange process on high oxalate bearing tanks and low sodium salt at end of Program. This would send DSS (containing oxalates) to saltstone. This interface risk exists for the first year of SWPF operations (prior to turnover to long-term operator).
472	DOE Directs Additional Business/Project Requirements on Lower Level Activities	Crosscutting Risk: All PBSs	Currently DOE O 413.3B and its associated guides and letters of interpretation apply a tiered structure to the application of requirements to projects and operations activities. A risk exists that DOE directs SRR to lower the threshold of the tiered structure and apply additional business/project requirements to lower level projects and activities. To handle this risk for PBS-SR-0014: Ensure DOE is appraised of the impact of these changes; Utilize appropriate baseline change control to incorporate changing requirement; anticipate review requirements and obtain and deploy contractor and DOE resources early. This is a crosscutting risk with all PBSs.

7.3 OPPORTUNITIES

16 opportunities were validated during the development of this ROMP. These opportunities are summarized in Appendix D.

7.4 NEAR-TERM RISK MANAGEMENT

Although the vast majority of risks can be handled early in the Program, it is not always cost-effective to expend funds on handling risk early. Risk handling strategies must be completed prior to the risk trigger i.e. the point at which the risk may be realized, however, the actual placement of the trigger in the System Plan execution schedule should dictate when the risk handling strategy is performed. Additionally, the realization of a major risk may change the System Plan and with a modified execution strategy, the PBS risk profile may change, raising the possibility that early risk handling for an unrelated issue may be counter-productive. Several risk handling strategies are identified as not being included within the current

baseline. If these strategies are required to be executed in support of near-term risk management, other less immediate risk handling strategies may be delayed (based on trigger points) to allow the funding of the more exigent strategies.

The focus of near-term risk management should be in the following areas:

- Execution of near-term "avoid" risk handling strategies
- Execution of risk handling strategies or Group 1 risks
- Execution of near-term opportunity handling strategies
- Execution of those risks whose handling strategies can only be implemented in the near-term.

Currently, very few risk handling strategies are unfunded, however, the priority risk handling strategies identified below must be reviewed to ensure they are, funded, scheduled and are being implemented successfully.

7.4.1 Execution of Near-Term Avoid Risk Handling Strategies

Of the risks avoided in this ROMP the following have near-term handling strategies:

High Risks
166 TiO2 Limits Within DWPF WAC Cannot be Sufficiently Raised to Support Salt Processing
366 More Pu is Required to be Dispositioned in Sludge Batches
460 SDUs are Not Available When Required (Acquisition Delays) (DOE Risk)

Moderate Risks
116 2H Evaporator Material and Chemical Balance Issues
394 New Waste Stream to Tank Farms (DOE Risk)
451 Site Utility Outage (DOE RISK)
454 Gas Retention in Waste Impacts Bulk Waste Removal

Low Risks
033 Heel Removal/Annulus Cleaning Flowsheet Interface Problems
176 Volume of Canyon Waste is Greater Than Planned
297 Infrastructure Modifications Are Not Completed When Required to Support SWPF Startup.
332 DWPF Facility Impacts Due to Additional Shielding Needs
401 Exec. order (#13514) Requires Facilities Reduce Greenhouse Gases (DOE Risk)
420 Saltstone Grout Pump Cannot Deliver Grout to SDUs
421 Glass Waste Storage is not Available After GWSB #2 is Filled (DOE Risk)
431 No Disposal Path Exists for Spent Solvent from SWPF
481 Downstream Flowsheet Impacts from TCCR Ion Exchange Media

High risks with specific action items should receive a high priority for handling strategy execution. Moderate risks with specific action items should also receive a high priority for handling strategy execution. Ensuring that these strategies are fully funded and scheduled will ensure these high and moderate risks are avoided.

7.4.2 Execution of Risk Handling Strategies for Group 1 Risks

Group 1 risks are those which can impact the Project in the near-term and which normally have near-term risk handling strategies. All group 1 risk handling strategies should be funded and scheduled for complete execution prior to the risk trigger being opened. In some cases the risk trigger is already open and these should be addressed with a higher priority.

7.4.3 Execution of Near-Term Opportunity Handling Strategies

Opportunities which may prove of benefit in the near-term should be pursued as the benefit will accelerate schedule and reduce costs in the NTB.

7.4.4 Execution of Near-Term Risk Handling Strategies

Group 2 risks are those risks that can be realized in the near-term with consequences of extending the Program completion date. These risks may be handled to mitigate the outyear impacts of risk realization in the near-term. Handing strategies should be prioritized by their effectiveness of risk reduction to ensure the maximum risk reduction for the minimum allocation of resources.

8.0 REFERENCES

1. Y-RAR-G-00022, PBS-SR-0014, Radioactive Liquid Tank Waste Stabilization and Disposition, Risk and Opportunity Management Plan (ROMP), Revision 10, July 2014.

2. DOE P 413.1, Program and Project Management Policy for the Planning, Programming, Budgeting and Acquisition of Capital Assets.

3. DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets, November 29, 2010.

4. DOE G 413.3-7A, Risk Management Guide, January 12, 2011.

5. Manual E7, Conduct of Engineering and Technical Support, Procedure 2.05A, LW Modification Traveler, Revision 5, January 14, 2016.

6. Y-RAR-G-00022, PBS-SR-0014, Radioactive Liquid Tank Waste Stabilization and Disposition, Risk and Opportunity Management Plan (ROMP), Revision 6, September 2010.

7. Systems Engineering Methodology Guidance Manual. SRR Manual WSRC-IM-98-00033, Appendix B, Revision 8, June 6, 2012.

8. SRR-LWP-2009-00001, Liquid Waste System Plan, Revision 19, May 2014.

9. SRR-LWP-2009-00001, Liquid Waste System Plan, Revision 20, March 2016.

10. Y-PRP-G-00002, PBS-SR-0014, Radioactive Liquid Tank Waste Stabilization and Disposition, Risk Management Board Charter, Revision 3, December 2014.

11. SRR Manual S14, SRR Business Management, Procedure 1.12, Risk Management, Revision 6, September 14, 2015.

APPENDIX A – Risk Documents Reviewed

Subject	Document
Saltstone Disposal Unit (SDU 6) Project	Y-RAR-Z-00012, Rev 2
Tank 12 Closure	Y-RAR-H-00051, Rev 2
Tank 15 Closure Project	Y-RAR-H-00088, Rev 0
Tank 26 Sludge Removal Project	Y-RAR-F-00061, Rev 0
SWPF Integration DWPF Modifications	Y-RAR-S-00027, Rev 0
SWPF Integration SPF Modifications	G-RAR-Z-00003, Rev 2
SWPF Integration Transfer Line Tie Ins	Y-RAR-S-00028, Rev 0
SWPF Integration Feed Tank 49	Y-RAR-H-00075, Rev 3
Lab Waste Handling	Y-RAR-S-00029, Rev 0
Interim Canister Storage – Double Stack	Y-RAR-S-00026, Rev 0

* Where a risk and opportunity assessment report has been approved and issued, it is listed in the "Document" column. If additional information has been generated as part of ongoing risk management since a report was issued e.g. updated risk and opportunity assessment forms (ROAFs) or riskometers, that latest information was used as an input to this PBS-SR-0014 Annual update.

APPENDIX B – 2014-2016 Interim Risk Log

Risk Identification and Action Assignment						Preliminary Assessment			Status	ROAF	Assessment Results / Risk Database Entry[2]		
Interim Risk Register ID #	Risk Owner ID[1]	Risk Event (Title)	Scenario or Risk Description	Risk ID Source	Action Required	PBS Category	PBS Assessable Element	Risk Category N = Near Term O = Outyear Or Group	Current status of revision	ROAF Number, Ready for Team review	Date Assessed	Risk ID # (ROAF #)	Disposition
			END OF 2013 - 2014 INTERIM RISK LOG										
345	TBD	Spread cement bags evently in Saltstone Vault.	It could be cheaper and easier to spread the bags as evenly as possible. Subject has been broached with the Environmental organization responsible for the PA and with our DOE Programs and it appears that there could be some alternative with respect to the bags, provided they can be spread without leaving any fast flow paths	Jackie Knight	Review as a potential opportunity.	12.1	5.1	N	N/A	N/A	3/11/2015	456	Reviewed during ROMP update to System Plan Revision 20 and new opportunity developed.
346	TBD	Build up of Mercury in Tank 22	Although it is considered non-credible at this time, sampling results are being analyzed to determine the chemical characteristics of tank 22 heel. If there is a signifcant mercury presenece, then a risk should be evaluated for carryover of mercury from DWPF	Hasmukh Shah	Review after sample results are obtained.	12.1		N,O	N/A	N/A	3/24/2015	N/A	Reviewed during ROMP update to System Plan Revision 20 and new risk added. See Risks 461 and 463.
347		Frit returned to Tank Farms in DWPF Recycle Creates Processing Problems	Tank 22 recieves DWPF recycle and a risk exists that frit carried over and back to the tank farm adversly impacts processing eg mechanically degrades systems.	Cliff Winkler	Review as a potential new risk		2.0	N,O	N/A	N/A	3/4/2015		Reviewed during ROMP update to System Plan Revision 20 and new risk added. See Risks 102 and 427.
348	TBD	Fill Cell H with Minimum Clean Cap Grout While Deployed Filling Other Cells	Opportunity to grout V4 adjacent cells while project is mobilized to grout Cell h with minimum clean cap grout. (FY 15 instead of 16)- Identified as Opportunity 054 in draft ROAR Y-RAR-S-00013, Rev 0.	Don Rohr	With the filling of Cell H, all Vault 4 cells would have roof rates less than 5 mrem/hr. This would not benefit the project, but would be a cost savings to the Program as filling Cell H would be less costly to perform as part of this project. Review prior to window of opportunity closing	10	5.1	N	N/A	N/A	7/28/2014	N/A	RMB Review not required- BCP 518 processed to exploit this opportunity (opportunity 54 in V-4 Project). Activity is in schedule.
349	TBD	Tanks targeted for removal of sludge to be used for SB Prep	A risk exists that tanks targeted for removal of sludge to be used for SB Preparation have less sludge than expected.	Gavin Winship	This may force changes to the sludge processing plan which would be non-impactive, however, if a feed break were to result, there would be an impact by not being able to process SWPF strip effluent.	10	4.2	N,O	N/A	N/A	3/12/2015	458	Reviewed during ROMP update to System Plan Revision 20 and new risk added.
350	TBD	Radio Trunking System Becomes Obsolete and Non-functional	The radio trunking system is outdated, and there are very few replacement parts, if any. Although the awareness of this issue has been raised, there are uncertainties surrounding funding and the time frame of a new system implementation. It is the responsibility of each tenant to be prepared in the event of a system failure. Each organization is encouraged to develop a contingency plan of action for use in the event of	Steve Okawa	This may be added to Infrastructure risk or be a separate risk depending on severity.	12.2	8.0	N	N/A	N/A	3/19/2015	TBD	Reviewed during ROMP update to System Plan Revision 20. This is not considered a significant risk and a workaround has already been identified. No further action is required.

Risk Identification and Action Assignment						Preliminary Assessment			Status	ROAF	Assessment Results / Risk Database Entry[2]		
Interim Risk Register ID #	Risk Owner ID[1]	Risk Event (Title)	Scenario or Risk Description	Risk ID Source	Action Required	PBS Category	PBS Assessable Element	Risk Category N = Near Term O = Outyear Or Group	Current status of revision	ROAF Number, Ready for Team review	Date Assessed	Risk ID # (ROAF #)	Disposition
351	TBD	Storage is Inadequate for Critical Equipment	713-2N and 3N are used to store spare critical equipment (pumps etc) for Liquid Wste operations. Recent inspections of these buildings (June 2014) have determined sprinkler systems to have been disconnected, presenting a potential "high challenge fire situation." The risk to critical spares is elevated. the total cost of spares at risk is between $90M - $250M.	Karen Lesko	After reports have been finalized, review and determine if immediate action is required (i.e. RMB).	12.2	8.0	N	N/A	N/A	3/19/2015	459	Reviewed during ROMP update to System Plan Revision 20. New risk 459 added.
352	TBD	Continuing reuse of old style tanks after completion of BWRE is considered unacceptable by SCDHEC	As part of System Plan 19 some old style tanks will be reused after BWRE has been declared complete. Some of these tanks will receive waste from other old style tanks, while others will receive waste from Type III tanks. A risk exists that SCDHEC will consider this practice unacceptable and be more likely to strictly implement FFA punative	Soni Blanco	Review this potential risk as either a single risk or as a contributing factor to an increased likelihood of realizing Risk 391 consequences (FFA and STP milestones missed).	2	6.0	N,O	N/A	N/A	3/24/2015	457	Reviewed during ROMP update to System Plan Revision 20. New risk 457 added.
353	TBD	Criticality Concerns Arise During sludge BWR	When bulk waste removal of sludge from sludge tanks that have had multiple uses during their lifetime, criticality issues may arise, creating the need for a change in the BWR strategy being executed.	Gavin Winship	Review this potential and add as a programmatic risk if required (also consider revision Risk 48 to include this aspect of physical properties as appropriate).	12.1	4.0	N.O	N/A	N/A	3/5/2014	48	Reviewed during ROMP update to System Plan Revision 20. Determined not to be a risk.
354	TBD	Rules defining Capital Asset Projects Change	The requirements by which Capital Asset Projects are defined is being revised. A risk exists that it may be changed in such a way as to impose the additional controls currently applied to Capital Asset projects to Operational Projects/Activities.	FY15 Execution Pre Mortem SRR-LWP-2014-00039, Risk 3.	Review as a Programmatic risk	11	8.0	N,O	N/A	N/A	4/8/2015	TBD	Reviewed during ROMP update to System Plan Revision 20 and Risk 472 added to the Program Risk Register.
355	TBD	Unable to obtain Saltstone Samples and execute analysis	Samples of emplaced Saltstone are planned to be taken to support PA R&D. A risk exists that the samples cannot be obtained/analyzed as planned and R&D supporting PA activities cannot be performed.	FY15 Execution Pre Mortem SRR-LWP-2014-00039, Risk 9	Review as a regulatory risk to identify imnpacts and as necessary develop a unique Program ROAF.	2	5.1	N,O	N/A	N/A	3/11/2015	TBD	Reviewed during ROMP update to System Plan Revision 20 and determined not to be a risk as mockup has validated process.
356	TBD	0.8 Ci/gal feed from MCU impacts attainment	Salt Batch 8 will provide a higher curie feed to MCU (~0.8 Ci). A risk exists this higher curie feed could impact attainment.	FY15 Execution Pre Mortem SRR-LWP-2014-00039, Risk 12	Review as a specific risk or a potential expanded risk 070.	12.1	4.1.2	N,O	N/A	N/A	3/6/2015	470	Reviewed during ROMP update to System Plan Revision 20 and Risk 470 added to the Program Risk Register.
357	TBD	Grout Vendor Issues	Vendors supply grout for tank closure . A risk exists that a prome vendor encounters issues that result in not being able to supply grout as needed during tank closure activities.	FY15 Execution Pre Mortem SRR-LWP-2014-00039, Risk 30	Review as potential change to Risk 400.	3	5.1	N,O	N/A	N/A	4/7/2015	400	Reviewed during ROMP update to System Plan Revision 20 and risk 400 updated to include grout supply risk.

Risk Identification and Action Assignment						Preliminary Assessment			Status	ROAF	Assessment Results / Risk Database Entry[2]		
Interim Risk Register ID #	Risk Owner ID[1]	Risk Event (Title)	Scenario or Risk Description	Risk ID Source	Action Required	PBS Category	PBS Assessable Element	Risk Category N = Near Term O = Outyear Or Group	Current status of revision	ROAF Number, Ready for Team review	Date Assessed	Risk ID # (ROAF #)	Disposition
358	TBD	Upset condition at MCU results in Tank 50 not being able to meet WAC	An upset condition at MCU could result in the need to flush MCU Feed tanks to Tank 50. If material is hi Ci, then a risk exists that Tank 50 may not be able to be qualified by blending with subsequent batches of DSS from MCU before Tank 50 fill limits is reached. The contents of Tank 50 would have to be returned to the Tank Farm and be processed back through ARP/MCU with other	SB 8 Systems Engineering Evaluation	Review along with IRL entry 356 as a potential new risk	12.1	4.1.2	N,O	N/A	N/A	4/6/2015	471	Reviewed during ROMP update to System Plan Revision 20 and Risk 471 added to the Program Risk Register.
359	TBD	Perform Interim Salt Processing Without an MST Strike	The 3116 WD allows interim processing of salt without an MST strike providing this can increase MCU production, while also relieving tank space and processing issues.	John Contardi/ Mark Keefer	Develop an opportunity prior to ROMP annual update and include in risk register. Add as an additional risk handling strategy to Risk 424 Salt Processing Limited by Actinide Removal Capacity (avoids risk) and Risk 094 Available Tank Farm Space Cannot Support System Plan (additional risk mitigation).	12.1	4.1.2	N,O	N/A	N/A	11/18/2014	453	**RMB Review not required** - New opportunity was developed and added to the risk register. This opportunity also is an alternate handling strategy for Risk 424 - Salt Processing limited by Actinide Removal Capacity and an additional handling strategy for Risk 94 - Available tank Farm Space Cannot Support System Plan.
360	TBD	ENG-38 Requirements Result in Backfit to Existing Process Flow Diagrams	During the assessment of risk on the alternate reductant project, a risk was identified that the ENG-38 requirements for Process Flowsheet preparation would result in having to update and issue formally, Process Flow Diagrams which have not been maintained as technical documents. This risk could be applicable to any modification which affects a flowsheet change anywhere in the liquid Waste System.	Gavin Winship	Review for potential as a Program wide risk that would be realized as facilities and flowsheets are modified.	12.1	8.0	N,O	N/A	N/A	4/7/2015	TBD	Reviewed during ROMP update to System Plan Revision 20. The procedure is being revised to exempt existing facilities from verbatim compliance. Any impact, even if exemption were not allowed would be additional cost to the Program, but no Program delays. This cost, in the worst case would be small and not considered sufficient to justify carrying this as a Program risk.

Risk Identification and Action Assignment						Preliminary Assessment			Status	ROAF	Assessment Results / Risk Database Entry[2]		
Interim Risk Register ID #	Risk Owner ID[1]	Risk Event (Title)	Scenario or Risk Description	Risk ID Source	Action Required	PBS Category	PBS Assessable Element	Risk Category N = Near Term O = Outyear Or Group	Current status of revision	ROAF Number, Ready for Team review	Date Assessed	Risk ID # (ROAF #)	Disposition
361	TBD	Loss of Historical Knowledge Base and Skills Due to High Workforce Attrition	Many SRR long-term employees are nearing their retirement age, many more are already eligible for early retirement. The significant historical knowledge held by these employees gathered over decades of Liquid Waste operations is already beginning to be lost as a critical resource. In the near future, these resources will no longer be available. Additionally, the basic training and skills of these employees are difficult to obtain in both a changing and competitive labor market. Other sites around the complex will also be in competition for the same resources as they too will generally experience the same condition.	Doug Bumgardner	Review for potential as a Program wide risk that would be realized as long-term employees begin to rapidly leave the workforce.	3	8.0	N,O	N/A	N/A	4/8/2015	TBD	Reviewed during ROMP update to System Plan Revision 20 and determined not to be a risk as measures are in place to avoid any significant impact (e.g. limited service and subcontractor positions for retired employees).
362	TBD	Sand Filter Requires Replacement	Recent radiation surveys indicate a potential trend that the DWPF sand filter will be expended prior to fulfilling its design life. A risk exists that this trend is real and a new DWPF sand filter will have to be constructed and tied in much earlier than scheduled.	Bill Barnes	Review as a potential risk during the annual update.	12.2	5.2	N,O	N/A	N/A	3/31/2015	468	Reviewed during ROMP update to System Plan Revision 20 and Risk 468 added to the Program Risk Register.
363	TBD	Boric acid modifications at DWPF cannot be performed to support NGS	DWPF modifications to allow processing of SWPF strip effluent with a boric acid flowsheet must be in place prior to the conversion of the SWPF flowsheet to operat using NGS. A risk exists that these modifications are not ready in time.	Keith Harp	Review as a potential outyear risk.	12.2	5.2	N,O	N/A	N/A	3/24/2015	461	Reviewed during ROMP update to System Plan Revision 20. This was not considered a risk as Boric acid modifications are only needed to support processing sludge during an SWPF outage. As sludge will match salt processing, there is no benefit from continuing sludge processing during an SWPF outage. The installation of a boric acid modification could be a handling strategy for having an additional amount of sludge within the Tank Farms if this emerges as a risk in future

Risk Identification and Action Assignment						Preliminary Assessment			Status	ROAF	Assessment Results / Risk Database Entry[2]		
Interim Risk Register ID #	Risk Owner ID[1]	Risk Event (Title)	Scenario or Risk Description	Risk ID Source	Action Required	PBS Category	PBS Assessable Element	Risk Category N = Near Term O = Outyear Or Group	Current status of revision	ROAF Number, Ready for Team review	Date Assessed	Risk ID # (ROAF #)	Disposition
364	N/A	Tank 48 Chemical Instability Impacts Waste Disposition	As part of the Focused Safety Management Program Independent Assessment of SRR, a special topic (Tank 48 Investigation/Communication Process), identified an opportunity for improvement. TK48-OFI-2 states "The Risk and Opprtunity Plan should be updated based on an evaluation of the potential impact of the tank 48 chemistry instability upon the waste disposition schedule."	Gavin Winship	Review as a potential new risk during the annual update.	12.1	4.0	N,O	N/A	N/A	3/12/2015	N/A	Reviewed during ROMP update to System Plan Revision 20. This is not considered a risk as a 20 year history of annual pumps runs and monitoring of Tank 48 have shown no indication of a trend towards changing chemistry.
365	TBD	Hanford Response to Vapor Issues Force Additional Requirements on Tank Farms	Hanford tank Farms have identified issues with tank vapor control and are in the process of addressing these issues. A risk exists that although different tanks and inventory, the measures that will be taken at Hanford to address these problems will be imposed on liquid Waste storage at SRS	Kent Fortenberry	Review as a potential new risk during the annual update.	12.1	4.0	N,O	N/A	N/A	3/25/2015	461	Reviewed during ROMP update to System Plan Revision 20 and determined to to be a risk. New risk added.
366	TBD	WACs Fail to protect operations and meet regulatory requirements	A risk exists that WACs developed to maintain waste processing flowsheets and meet regulatory requirements could be rendered inadequate to perform those functions. This could occur by the introduction of, or increase in, species (either accidentily or intentionally) which were evaluated as not being of interest and are not included within the WAC. This can occur by not fully identifying the total effects of species for which limits have been established or by altering process variables, unit operations/sequences during operations and accidentally introducing previously unidentified	Richard Edwards	Potential issues identified during recent operations, PISAs, increased and unexpected mercury levels within the Liquid Waste System (Evaporator, DWPF recycle) and unexpected mercury leaching from TCLP samples have indicated a potential for this risk to be realized.	12.1	4.0	N,O	N/A	N/A	3/25/2015	N/A	Reviewed during ROMP update to System Plan Revision 20 and determined to to be a risk. New risks 462 through 467 added.
			END OF 2014 - 2015 INTERIM RISK LOG										

Risk Identification and Action Assignment						Preliminary Assessment			Status	ROAF	Assessment Results / Risk Database Entry[2]		
Interim Risk Register ID #	Risk Owner ID[1]	Risk Event (Title)	Scenario or Risk Description	Risk ID Source	Action Required	PBS Category	PBS Assessable Element	Risk Category N = Near Term O = Outyear Or Group	Current status of revision	ROAF Number, Ready for Team review	Date Assessed	Risk ID # (ROAF #)	Disposition
367	TBD	STAAD.Pro® Structural Analysis Software Error	STAAD.Pro® Structural Analysis Software Error—SRR received notice from SRNS (software owner) that the Bentley company informed them that two errors were discovered in the STAAD.Pro® software application used across SRS since 2009 for structural analysis and design. The errors are specific to the treatment of seismic response spectrum loads. SRR identified 25 specific structural calculation items had been affected. The affected calcs have been prioritized and are being reanalyzing to identify any impact and actions to address deficiencies.	SRR Monthly Status Report	If significant potential rework exists, add as a new risk to the Program Risk Register.	1	8.0	N,O	N/A	N/A	2/9/2016	N/A	Reviewed during the ROMP update. Corrective action has been developed. Procedures are in place. Calculations will be re-run using the updated and compliant software. No modifications are expected and this is no longer considered a risk.
368	N/A	Anti-Foam Creates Flammability issues and Slows Down DWPF Processing	The flow sheet validation report developed by Savannah River National Laboratory (SRNL) (Salt Batch 8 and Alternate Reductant) showed unacceptable levels of flammable hexamethyl disiloxane are being produced in the DWPF Chemical Process Cell from anti-foam agent decomposition. Anti-foam has been used in the vitrification process since operations began in 1996. The DWPF DSA assumes the anti-foam breaks down in the melter and break down at the CPC was not anticipated. A PISA has been declared and additional tests have been initiated	PISA Report	Review as potential risk for inclusion into the Program Risk Register	12.1	4.0	N,O	N/A	N/A	1/21/2016	476	Reviewed during Annual Update - This is incorporated in Risk 476.
369	N/A	Integration of Flowsheet Changes	A risk exists when integrating the flowsheets of Alternate Reductant, SEFT to SME, Dry Frit and SWPF. While the Alternate Reductant project has scope limited deployment under current process conditions, the later addition and modification of the flowsheet to accommodate SEFT to SME, Dry Frit and SWPF may uncover new issues.	Alternate Reductant Risk Review SRR-LWP-2015-00020	Review as potential risk for inclusion into the Program Risk Register	12.1	8.0	N,O	N/A	N/A	2/1/2016	477	Reviewed during Annual Update - This is incorporated in Risk 477.
370	TBD	Flammability Issues within the HLW System (DWPF, Saltstone, Tank Farms)	Current flammability models for DWPF has been found to be deficient (See IRL 358). A risk Exists that there could be other deficiencies within the flammability models for DWPF, Tank Farms and/or Saltstone	John Gregory	Review as potential risk for inclusion into the Program Risk Register - Handling would be to review and validate flammability models with curent flowsheet.	12.1	8.0	N,O	N/A	N/A	1/26/2016	477	Reviewed during Annual Update - This is incorporated in Risk 477.
371	TBD	Increased levels of Dimethyl Mercury	A risk may evolve based on trending of speciation results that the proportion of Dimethyl mercury in the Tanks Farms increases.	Mark Schweder	Review as a potential risk during the annual update.	12.1	8.0	N,O	N/A	N/A	1/26/2016	TBD	Reviewed during Annual Update - This is incorporated in Risk 466.

Risk Identification and Action Assignment						Preliminary Assessment			Status	ROAF	Assessment Results / Risk Database Entry[2]		
Interim Risk Register ID #	Risk Owner ID[1]	Risk Event (Title)	Scenario or Risk Description	Risk ID Source	Action Required	PBS Category	PBS Assessable Element	Risk Category N = Near Term O = Outyear Or Group	Current status of revision	ROAF Number, Ready for Team review	Date Assessed	Risk ID # (ROAF #)	Disposition
372	TBD	SWPF Strip Effluent Processing Results in DWPF Recycle too High in Cs for Tank Farm	During the development of the Tank 49 Feed Risk Register, a risk was identified that the SWPF strip effluent, being high in Cs could result in DWPF recycle not meeting the tank Farm WAC.	Noel Chapman	Review as a potential risk during the annual update.	12.1	8.0	N,O	N/A	N/A	2/9/2016	N/A	Reviewed during Annual Update - This is not considered a risk as long-term abnormal operations would have to be allowed to result in unacceptable Cs levels in recycle
373	TBD	MCU Piping Configuration Changes for Operation Until SWPF ATO	An opportunity exists to configure MCU piping to allow full operation of MCU until SWPF ATO.	Keith Harp	Review as a potential opportunity during the annual update.	12.1	4.1.2	N,O	N/A	N/A	1/14/2016	N/A	Reviewed during Annual Update - Closed, opportunity has been realized.
			END OF 2015 - 2016 INTERIM RISK LOG										

APPENDIX C – Risk Summary Table

High Residual Risk Level

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
011	Tank Farm Infrastructure/Equipment Failure (Not Including Transfer Lines or 3H Evaporator)	Group 1	12.2	Very Likely	Severe (Critical)	High	Mitigate	Currently the evaluation of system health of key systems is performed for the HTF and FTF facilities, needed spares are identified, and procurement initiated, however funding restrictions can result in not being able to obtain spares as needed (see funding risk 027). The procurement of spares will be "prioritized" to establish visibility and ensure effective use of funding is maintained. In addition to these already established programs, HTF East Hill Utility Services Upgrades have been initiated and should be planned and funded for completion. Ensure that Infrastructure maintains the appropriate visibility on the Critical Infrastructure IPL. Develop "stop-gap" measures that can be deployed to minimize impact of failure (e.g. temp mods). Develop operating strategies which provide tank space to receive recycle (e.g. schedule solids removal campaigns more frequently from Tank 22) and other streams to enable the HLW facilities to maintain operation when infrastructure failures occur.	High
204	Interarea Transfer Line Failure	Group 1	12.2	Very Likely	Significant	High	Accept	This risk is accepted based on performing system health reviews and leak detection testing.	High
295	Tank Farm Transfer Line Failure	Group 1	12.2	Very Likely	Significant	High	Mitigate	Monitoring specific transfer line health and developing tailored inspection and maintenance activities as part of the ongoing program. Investigate transfer line alternatives (hose in hose) and develop approved guidelines as to when they can be deployed. Investigate with regulators the limited use of degraded secondary containment for transfers. (case by case risk-based evaluation).	High
472	DOE Directs Additional Business/Project Requirements on Lower Level Activities (DOE Risk)	Group 1	10.0	Very Likely	Severe (Critical)	High	Mitigate	Ensure DOE is appraised of the impact of these changes; Utilize appropriate baseline change control to incorporate changing requirement; anticipate review requirements and obtain and deploy contractor and DOE resources early.	High

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
027	Program (PBS-SR-0014) Funding Impacted by Competing Priorities (DOE Risk)	Group 2	03.0	Very Likely	Very Severe (Crisis)	High	Mitigate	Funding is requested with significant justification to support operations activities and projects (including consequences of not executing operations activities and projects). Communicate impacts if early funding is not available and monitor change after receiving funding. SRR currently develops funding strategies to support meeting the System Plan. System Plan adjustments are identified to compensate for funding shortfalls. If it is determined adjustments are required, the System Plan will either be revised and/or projects/operations activities will be extended or cancelled. Execute cost savings initiatives (iACT) and schedule approved initiatives in P6 for execution. Established Mission for Excellence Group to use lean tools to identify improvements in execution processes (e.g. VSA, RIE).	High
090	Tank Farm Tank Availability and Infrastructure Does Not Support Salt Processing Operations	Group 2	10.0	Likely	Severe (Critical)	High	Mitigate	Enhanced modeling techniques are being employed to analyze time and motion of transfer and feed preparation strategies. From this modeling, the need for modifications to infrastructure can be identified and prioritized as appropriate.	High

Moderate Residual Risk Level
(Sorted by Group)

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
012	DWPF Equipment Failure (Excluding Melter)	Group 1	12.2	Very Likely	Significant	High	Mitigate	The current program replenishes assembled unit spares, revalidates present list of equipment identified to be maintained as spares and verifies that minimum quantity of spares are maintained on hand and procured as needed, however, reduced funding levels may impact these activities (see risk 027). The procurement of spares will be "elevated" to establish visibility and ensure correct prioritization of funding is maintained. In addition to these already established programs, system life extension will be investigated. Failure analyses are being performed on failed equipment to identify solutions to any weaknesses in design. Incorporate lessons learned to increase longevity of components.	Moderate
286	DOE Requires DWPF AB Update to Latest STD (3009) Based on Number/Significance of Changes (DOE Risk)	Group 1	09.0	Very Likely	Marginal	Moderate	Accept	Accepted as part of the current DSA approach, as operations activities are being implemented that modify DWPF (e.g. SDI, Alternate Reductant, etc.), the DSA is being updated to current practices. Ongoing discussions are being held with DOE on the activities that may impact DWPF and the Hazards analysis and safety analysis are being updated as part of those operations activities.	Moderate
299	Tank Leaks to Environment During Tank Cleaning Step	Group 1	12.2	Very Unlikely	Severe (Critical)	Moderate	Mitigate	Maintain liquid levels as low as practical during cleaning. Use lower chemical concentrations and limit acid residence time. Implement staged contingency transfer system per operations plan; Avoid risk on single wall (Type IV) tanks by not performing acid cleaning in these tanks. Developing technology to perform enhanced mechanical cleaning is an ongoing activity. For tanks evaluated as being susceptible to corrosion failure, design and install annulus transfer capability prior to tank cleaning. As lessons are learned relative to the potential impacts of chemical cleaning with limited concentrations, utilize them to establish acceptable thresholds for chemical cleaning.	Moderate

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
445	Scope to be Added to PBS-0014 Due to Dispersion Characteristics Change is not Defined (DOE Risk)	Group 1	09.0	Very Likely	Significant	High	Mitigate	SRR will perform upfront studies and will work closely with DOE to minimize the impact of this change.	Moderate
463	Increased Level of Mercury in Saltstone Grout	Group 1	12.1	Unlikely	Severe (Critical)	Moderate	Mitigate	Form a task team to investigate the fate of mercury in the HLW System and make recommendations; Reestablish mercury removal capability at DWPF. Clarified TCLP Performance Criteria for Hg is the toxicity threshold.	Moderate
021	Replacement DWPF Melter Failure	Group 2	12.2	Likely	Marginal	Moderate	Mitigate	Currently, as repairs are needed on the melter, techniques are developed and procedures issued to allow repairs. These procedures, techniques and specialized equipment etc., are maintained for future use. A program currently exists for monitoring system health and the results of the program are incorporated into future melter fabrication, (e.g. use of insert in pour spout). An active program is maintained for remote repair of cooling water leaks (a known potential for early melter failure). Develop (as far as practical) a strategy, recovery schedule and work packages for removal of Melter 3 upon encountering a premature failure.	Moderate
030	3H Evaporator Material and Chemical Balance Issues	Group 2	12.1	Likely	Significant	Moderate	Mitigate	Currently an Evaporator Feed Qualification Program is employed to mitigate this event. Transfer Plans include evaporator transfers and are maintained current, change controlled, and approved by facility management. Additionally, the current Program gathers experience gained from previous sludge batch preparations (e.g. risk assessments/mitigation, sludge washing strategy) and incorporates this into planning of the next sludge batch. Any new missions run by H-Canyon would be characterized, evaluated and approved through a formalized WAC process. A realistic salt evaporator model has been developed, however it has not, as yet, been implemented.	Moderate

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
034	DWPF Impacted by Chemistry/Rheology of Sludge Waste Feed	Group 2	12.1	Very Likely	Marginal	High	Mitigate	As part of ongoing operations, frit formulations are currently subjected to continuous optimization and new frit formulations are being investigated and developed. As part of the current program, process changes at DWPF that will more readily accommodate handling of sludge waste with differing chemistry/rheology are evaluated and recommended and tank sequencing is evaluated to make up sludge batches that minimize rheology issues. Additionally, evaluate and address issues with increased level of sulfate in sludge feed. Implement the process improvement recommendations of the DWPF reliability review team. Investigate areas where more robustness can be added to the processing system (e.g. different types of pumping systems).	Moderate
045	Higher Curie Sludge Impacts DWPF Canister Production	Group 2	12.1	Likely	Significant	Moderate	Mitigate	Currently a Sludge Batch Qualification Program is implemented for each sludge batch during which the sludge is qualified for processing through DWPF. Continuing integration efforts with H-Canyon are proceeding to assist in evaluating future missions' impacts on sludge contents in H-Tank Farm. Also considering sludge curie / wattage issues when planning future sludge batches. Ensure Tanks 32, 35 and 39 are sequenced as early as feasible to reduce any potential impacts. Additionally perform sampling and analysis of the sludge contents of Tanks 32, 35 and 39. Develop a blending strategy to avoid any impact of higher curie sludge to processing and incorporate into processing plan. Revise AB as necessary, taking advantage of benefits from alternate reductant deployment, to reflect processing of these tanks.	Moderate
083	Non-routine Constituents in Sludge Impact Canister Production Rate	Group 2	12.1	Very Likely	Severe (Critical)	High	Mitigate	As part of the normal planning evolution, lessons learned are reviewed and incorporated into each revision of the Sludge Batch Plan. These lessons learned are from previous sludge removal, preparation and processing campaigns and in the execution of sludge batch preparation. Sludge batch preparation includes sampling and qualification. The processability recommendations from the 2013 DWPF reliability review team will be incorporated into DWPF operations.	Moderate

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
091	Close Coupling-SWPF, DWPF, ARP/MCU and SPF Limits Waste Processing Throughput (Non-Chemistry)	Group 2	12.1	Very Likely	Significant	High	Mitigate	COREsim modeling has been performed on several major areas of the LWO system and additional modeling will be performed to include ARP/MCU and help identify potential "fixes" to support a higher waste processing throughput. Facilities will maximize the use of redundancy, spares and predictive maintenance. Facilities will closely coordinate planned outages. Implementing modifications to DWPF (e.g. alternate reductant, TiO2 testing, maximum Cs canister content and water reduction modifications), SPF (e.g. SSRTs and increasing shift coverage).	Moderate
094	Available Tank Farm Space Cannot Support System Plan	Group 2	03.0	Very Likely	Significant	High	Mitigate	Working with planning on an ongoing basis to prepare and maintain integrated facility schedule for weekly transfer plan; Weekly meetings are conducted with Sludge Batch Team to prepare for sludge batch transfers; Statusing schedules and integrating with facility operations; Briefing Facility and Project Management regularly on tank working space issues to ensure an understanding of project implementation and facility operations impacts on tank working space; Periodically updating System Plan and supporting documents to stay in alignment with major facility operational start dates, processing rates and to account for any major emergent space issues; Identifying and implementing actions to achieve space gain within the Tank Farms and monitoring and optimizing Evaporator performance based on trending of results and applying corrective action. Investigate continued load sharing between Evaporators, Investigate reducing restrictions on old style tanks, extend ion echange processing capabilities. By using a no MST process, MCU throughput could be increased from 1.4Mgals/yr to 2Mgals/yr for an additional 12 month period achieving up to 600Kgal space gain.	Moderate
145	Limited DWPF Laboratory Capabilities Challenged by New Constituents	Group 2	10.0	Likely	Marginal	Moderate	Accept	Accepted as part of the current program, each sludge batch preparation schedule includes a validation of the existing laboratory analytical methods by SRNL to identify if any new sludge constituents interfere with the existing analysis techniques. Where analytical methods and/or equipment are not adequate, replacement and modifications are performed.	Moderate
149	HLW Tank Leak Requires the Use of Contingency Space	Group 2	12.2	Unlikely	Severe (Critical)	Moderate	Mitigate	Salt processing is planned to achieve space gain and tank chemistry control programs prevent tank conditions that facilitate leak development.	Moderate

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
168	SWPF Does Not Achieve System Plan Throughput / Attainment	Group 2	12.1	Very Likely	Significant	High	Mitigate	The process will be optimized based on incorporation of ARP/MCU lessons learned and data on actual SWPF operating experience (optimize operating parameters e.g. molarity [Na], solvent composition etc.) to lower the likelihood of this event and to also develop additional capacity for salt processing to recover from unforeseen outages. These strategies effectively mitigate the consequences of this risk. Investigate developing sprint capacity and/or work arounds allowing downstream facilities to match SWPF sprint capacity above 9 Mgals/yr to ascertain if this is a viable strategy to pursue.	Moderate
205	SWPF Not Available When Planned (DOE Risk)	Group 2	10.0	Likely	Significant	Moderate	Mitigate	The management of the EPC contract is being performed by DOE-SR and handling of risks that may challenge the startup date of SWPF is the responsibility of DOE-SR. The DOE Federal Project Director will continue to monitor EPC contractor performance against the baseline schedule. The EPC contractor has developed a risk management plan for the SWPF project and is currently implementing the plan to handle these risks. Contract mechanism has been modified to incentivize construction complete (Milestone of December 2016 has been incentivized to an early completion in April 2016) and also to share schedule and cost risk with the EPC. Additional risk handling strategies are directed at maintaining the program completion milestones by extending operation of ARP/MCU through or beyond 2020.	Moderate
251	Aluminum Dissolution Impacts Saltstone Processing	Group 2	12.1	Likely	Significant	Moderate	Mitigate	Investigate the trade-off between feed adjustment and modified grout placement strategies aimed at reducing the heat of hydration. Investigate modified grout formulations to identify the optimum feed to minimize this impact. Perform ongoing grout testing as part of the ongoing program and incorporate results into planning.	Moderate

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
267	Schedule For Complex Concurrent Activities Not Sustainable	Group 2	10.0	Very Likely	Significant	High	Mitigate	Currently detailed integrated facility schedules are being maintained to coordinate planned activities and System Plan and changes to the System Plan are routinely communicated to Facility and Project Management. Facility and Project Managers are involved early in the project/operations activity development to understand project implementation impacts on on-going facility operations. Once understood, these impacts are accommodated and incorporated into the design, construction and turnover. Continuing to identify and resolve integration issues as any major assumptions change or as new issues arise. Working with internal and external stakeholders to communicate the System Plan. System Planning process now includes: Annual updates to the System Plan; Conducting thorough, integrated planning, prioritization and management of closure operations, with full consideration of physical, logistical and operational constraints; Analyzing and managing schedule contingency (lead and lag times) to build in margin; Effecting work area improvements, including installation of more lighting and segregation of work activities, to permit three-shift closure operations, and developing and maintaining current a COREsim integrated Liquid Waste model to better identify system bottlenecks.	Moderate
427	DWPF Recycle Contains High Proportion of Solids	Group 2	12.1	Unlikely	Very Severe (Crisis)	High	Mitigate	Use of alternate reductant will result in the use of less antifoam and potentially reduce solids carryover in DWPF recycle stream. Use of Dry Frit will greatly reduce the volume of DWPF recycle. Identify multiple receipt tanks for receiving DWPF recycle. Implement a sampling strategy at DWPF to reduce flammability impacts associated with the solids carryover by determining what portion of the solids are sludge are which are non-heat bearing solids (e.g., frit).	Moderate
435	High Mercury in Sludge Impacts Processing at DWPF	Group 2	12.1	Likely	Severe (Critical)	High	Mitigate	The current program investigates Sludge Batch configurations to minimize the amount of Mercury in each batch. Additionally, where not impactive to canister production, sludge batch planning will investigate reducing waste loading to allow a reduced amount of mercury in each sludge transfer to DWPF. Investigate maximizing mercury strip efficiency in the SRAT (e.g. increasing steam flow to vessel).	Moderate

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
446	Saltstone WAC for I-129 Impacts Salt Processing	Group 2	12.1	Very Unlikely	Severe (Critical)	Moderate	Mitigate	Further investigate and develop a path forward which includes a plan to reduce uncertainty in the I-129 inventory and investigate parameters within the PA which may allow for a higher level of I-129 in some or all of the disposal units. This approach will build upon WCS improvements made and include any necessary R&D and testing. This approach should ultimately target enabling the I-129 WAC limit to be raised if necessary. Develop a path forward to allow a "totalized" measurement of I-129 to be used as part of the WAC which will accommodate averaging of I-129.	Moderate
457	SCDHEC does not Allow Temporary Use of Old Style Tanks After BWRE	Group 2	02.0	Unlikely	Severe (Critical)	Moderate	Mitigate	Continue dialogue with SCDHEC to ensure the regulators are aware of the impact of not allowing limited re-use of old-style tanks after BWRE (i.e. material at risk for longer, SWPF not operating at full capacity, program slowed down with additional costs for PBS-SR-0014 and follow on closure PBS-SR-0030).	Moderate
458	Targeted Sludge Tank Does not Contain Predicted Quantity of Sludge	Group 2	12.1	Likely	Severe (Critical)	High	Mitigate	Investigate acceleration of making an alternate tank ready prior to scheduled need date. Implement actions as feasible to accelerate. Continue processing with a lower sludge loading to prevent impacts to SWPF and/or lower the canister production rate while still avoiding any impact to SWPF.	Moderate
467	Oxalates Impact Salt Processing	Group 2	12.1	Very Likely	Significant	High	Mitigate	Minimize oxalate use, i.e. 512-S filter cleaning and tank cleaning. Use an ion exchange process on high oxalate bearing tanks and low sodium salt at end of Program. This would send DSS (containing oxalates) to saltstone.	Moderate
436	Excessive Sludge Carryover During Boil Up	Group 3	12.1	Likely	Severe (Critical)	High	Mitigate	Installed anti-foam metering system for SRAT and SME; optimized Melter offgas flammability model; Installed purge in RCT. These modifications are improving the sludge carryover and the management of solids in the system. Develop a water balance.	Moderate
400	Single Source Supply Chains Fail to Deliver Materials/Equipment When Needed	Group 4	03.0	Likely	Marginal	Moderate	Mitigate	When developing technologies for deployment which use single source, exotic or specialty materials and/or equipment or rely upon single source/proprietary technology development, the potential for single source supply chain failures should be included. Development of backup technologies, alternate materials should be investigated to provide mitigation for these events. When deploying these technologies/processes, establish the ability to obtain spares, replenish materials, develop alternative sources, etc., sufficiently in advance to allow recovery should the single source chain fail.	Moderate

Low Residual Risk Level
(Sorted by Group)

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
018	Saltstone Processing Facility (SPF) Cannot Achieve Attainment	Group 1	12.2	Very Likely	Negligible	Low	Mitigate	Currently performing system health evaluations and ensuring adequate spare parts/equipment are identified and on hand to support facility operations is part of ongoing operations. The procurement of spares is "prioritized" to establish visibility and ensure correct prioritization of funding is maintained. Investigation of methods to mitigate the impact of a Saltstone unplanned outage has been performed and the integration of facilities response to a SPF outage is an ongoing process. In addition to these already established programs, an improved system health program has been implemented. Performed investigation, evaluated and recommended improvements to achieve enhanced capacity and reliability (Enhanced Low Activity Waste Disposal - ELAWD Phase 2).	Low
042	Salt Waste Heel or Tank Annuli Waste has to be Processed Through DWPF	Group 1	12.1	Likely	Marginal	Moderate	Mitigate	Currently, early salt dissolution campaigns will be closely monitored for rates and effectiveness. Develop a plan (system plan/sludge/salt processing plan), based on data obtained, to allow processing by SWPF/DWPF of salt from tank heel or annulus by introduction of a revised plan which will disposition during salt/sludge batch preparation.	Low
117	Oxalates from Acidic Tank Cleaning Cause Sludge/Salt Batch Preparation Problems	Group 1	12.1	Likely	Marginal	Moderate	Mitigate	As part of system planning, process heels are integrated into sludge batches to minimize impacts of oxalates. Flowsheets will be developed as part of the execution of chemical cleaning with OA for each tank to be chemically cleaned. Minimize the introduction of oxalates into the system wherever possible (during flowsheet development). Evaluate the need for chemical cleaning on a tank by tank basis as part of flowsheet development. Where chemical cleaning is determined to be required, evaluate the effectiveness of chemical cleaning vs the benefit with respect to system plan impacts. Use an ion exchange process (TCCR) on high oxalate bearing tanks and low sodium salt at end of Program. This would send DSS (containing oxalates) to saltstone.	Low

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
174	Tank Cleaning Not Sufficient for Tank Closure (DOE Risk)	Group 1	05.0	Unlikely	Significant	Moderate	Mitigate	Currently, investigation and evaluation of new technologies for mechanical and chemical cleaning is part of the program as well as working with the other DOE Sites and National Laboratories through conferences e.g. annual Waste Management Conference and Tank Waste Corporate Board, to improve or develop new technologies. Lessons learned from previous successes on implementing tank cleaning technologies are continuously incorporated to improve the closure process.	Low
175	Canyon Waste Contains Rogue Constituents (DOE Risk)	Group 1	10.0	Unlikely	Significant	Moderate	Mitigate	As part of ongoing program activities a system impact analysis methodically examines the potential impacts of all waste received to downstream processing facilities. New missions within the Canyon creating new waste streams would result in the need to revise contractor agreements with DOE.	Low
182	Radioactive Release From Tank Farm	Group 1	09.0	Unlikely	Marginal	Low	Accept	This risk is accepted based on the low probability and the current safety controls and operational controls e.g. ALARA, maintenance and operational procedures.	Low
197	DWPF Transfer Line Failure	Group 1	12.2	Very Unlikely	Significant	Low	Accept	20 years of operations have been performed without any indication of line degradation. Programs are currently in place to perform inspections and maintenance.	Low
209	Impacts of NRC Monitoring of 3116 Implementation for Salt Processing (DOE Risk)	Group 1	02.0	Very Unlikely	Marginal	Low	Mitigate	Strategies to close existing NRC Monitoring open issues, activities and recommendations with innovative application of existing programs, processes and resources and by minimizing modifications to projects and Program delays have been developed. Currently, as part of the Program, R&D and facility activities are being implemented as early as possible to address existing open issues, activities and recommendations and close communications are being maintained during monitoring to proactively provide information and avoid delays to the Program. The SDF PA has been revised and implemented. Additional information is being provided to support closure of NRC open issues, activities and recommendations. Strategies to close any new NRC monitoring issues or recommendations that arise will be generated and reviewed with the NRC. Complete an SDF SA to address NRC questions and Type IV letter. Develop a crosswalk of NRC concerns versus PA maintenance program and the FY2013 SDF SA. R&D is being performed to provide an empirical basis for the FY14 SDF SA.	Low

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
213	NRC Activities for Monitoring of Closure Process Not Well Defined (DOE Risk)	Group 1	02.0	Very Unlikely	Negligible	Low	Accept	This risk is accepted as current process maximizes communication between NRC, DOE and SRR. No additional handling strategies are available and the risk exposure is negligible.	Low
219	DWPF Criticality Concerns During SWPF Processing and/or Sludge Batch Processing	Group 1	12.1	Very Unlikely	Negligible	Low	Accept	Accepted as 5% enrichment level has been established.	Low
257	Inter-Area Transfer Line "Salts Out"	Group 1	12.1	Very Likely	Negligible	Low	Mitigate	A temp mod high point flushing capability has been developed. Inter-Area Dilution Facility in F-Area may be used to add water in FPT-1 during salt solution transfers to lower the SG.	Low
291	Skilled Craft Labor is Not Available to Support Liquid Waste Needs	Group 1	03.0	Likely	Marginal	Moderate	Mitigate	As part of ongoing craft support planning, availability will be regularly validated with local unions and shortfalls predicted in sufficient time to work with local unions to seek craft labor from outside the immediate area. Mechanisms are in place and maintained to facilitate obtaining additional craft labor when needed.	Low
325	DWPF Dry Frit System Experiences Frequent Pluggage	Group 1	12.1	Very Unlikely	Marginal	Low	Mitigate	Minimize the D&D of the existing system to allow wet frit slurry delivery system to be easily re-installed. Perform extensive mockup testing of the dry frit delivery system before installation. Testing to include a range of transient conditions that may be encountered during operation. Gather and utilize lessons learned from other facilities utilizing this process (e.g. Sellafield).	Low
344	3H Evaporator Pot Failure	Group 1	12.2	Unlikely	Significant	Moderate	Mitigate	Develop as far as practical the design and procurement specification for a replacement evaporator pot, to minimize the time needed to procure a replacement. Evaluate alternate handling of sludge wash water as salt process adjustment medium.	Low
346	Tank Closure Sampling Strategy is Not Effective	Group 1	02.0	Very Unlikely	Negligible	Low	Mitigate	Review sampling and analysis results as early as possible and determine the need for additional sampling on preliminary statistical analysis results. Lessons learned will be used to modify the sampling strategies for the remaining tanks and future occurrences of the event may be avoided.	Low
418	DOE Requires USQE to be Performed on all Modifications (DOE Risk)	Group 1	09.0	Very Likely	Negligible	Low	Mitigate	Work with DOE and SRNS to minimize potential impacts.	Low

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
426	Acidic Chemical Cleaning is Required on Non-Sludge Solids Tanks	Group 1	12.1	Unlikely	Negligible	Low	Mitigate	Develop a position on the effectiveness of acidic chemical cleaning with respect to mechanical cleaning. Use this position to minimize the number of source tanks for sludge solids tanks that would have to undergo chemical cleaning as opposed to extended mechanical cleaning should issues arise with meeting tank cleanliness requirements.	Low
430	No Disposal Path Exists for Spent Solvent from ARP/MCU	Group 1	02.0	Likely	Negligible	Low	Mitigate	Identify alternate disposal paths, e.g. vendors upfront to allow effective disposal. Develop effective strategy for remediation and/or disposal of waste to avoid any RCRA violations prior to SWPF startup.	Low
440	Prior to Closure Contamination Migrates from Vault 4	Group 1	02.0	Unlikely	Negligible	Low	Accept	This risk is accepted as any remediation/preventative measures would be tailored to the contamination path/mechanism encountered. Currently these are being applied to what has been experienced at Vault 4 to date (Reference V4 Contamination Minimization Study)	Low
448	Salt Precipitated from DWPF Recycle Requires Criticality Sampling Prior to Dissolution	Group 1	12.1	Likely	Significant	Moderate	Mitigate	Identify early, those tanks where this event could occur (e.g. Tank 37 FY16 dissolution campaign), ensure sufficient time is allowed in batch planning to perform a NCSE evaluation without impacting salt dissolution. Develop a backup strategy to take these salt source tanks off line should the event occur and be able to substitute with an alternate salt feed tank to avoid feed break. This would enable the tank of concern to be sampled and NCSE performed in parallel with salt batch preparation so that it is available as a source tank for another salt batch.	Low
450	SWPF Accelerated Salt Dissolution Does not Permit NCSE Aerial Density Analyses Techniques	Group 1	12.1	Unlikely	Significant	Moderate	Mitigate	Investigate the validity of aerial density techniques during accelerated salt dissolution. If invalid, ready sampling and analytical facilities and integrate these activities into Salt Batch planning. Program delays will be avoided.	Low
455	TSR Limit Prevents Tank Entering Closure Mode After Cleaning has Been Completed	Group 1	09.0	Likely	Negligible	Low	Mitigate	Develop, on a tank by tank basis, cleaning strategies to meet TSR and MEP (e.g. continual sampling, after BWR sample to provide indication of how much cleaning would be required to enter closure mode). Additionally, where more effective, investigate utilizing a safety basis change to allow closure to proceed.	Low
461	Additional Requirements Imposed on Tank Farm Operation Due to Hanford Vapor Issues	Group 1	09.0	Unlikely	Negligible	Low	Mitigate	Evaluate the Hanford Tank Vapor Assessment Report recommendations. Determine applicability to SRR, whether the SRR program has deficiencies related to the recommendation, and an action plan to resolve identified deficiencies.	Low

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
466	Increased Levels of Mercury in HLW System Creates Industrial Hazards	Group 1	09.0	Unlikely	Negligible	Low	Mitigate	Evaluate the dermal contact hazard resulting from the increasing mercury concentrations in the waste to determine if mitigation is needed.	Low
479	TCCR is Not Available When Planned	Group 1	10.0	Likely	Negligible	Low	Accept	Risk management and controls are being applied at the level to minimize the potential for delay.	Low
480	TCCR Does not Perform as Required	Group 1	12.1	Likely	Negligible	Low	Accept	Based on R&D and prototypical work performed or planned prior to deployment, this risk has been reduced as far as practical.	Low
036	Sampling and Analysis of Salt Feed to ARP/MCU Shows SPF WAC Cannot be Met After Processing	Group 2	12.1	Unlikely	Negligible	Low	Mitigate	Sample source tanks prior to salt processing to establish a high confidence level in suitable feed tank selection and preparation. As part of salt batch qualification, perform bench scale tests as early as feasible using real waste samples of intended feed sources to validate decontamination factor assumptions.	Low
037	DWPF Impacted by Chemistry / Quantity of Salt Waste Feed	Group 2	12.1	Unlikely	Significant	Moderate	Mitigate	Bi-monthly meetings are being held between EPC contractor and LWO to exchange lessons learned and technical data. The meetings have been adopted as part of the normal operational process. The intent of this close exchange is to identify as early as possible any indications that planning assumptions and bases changes have occurred (volume may increase/chemistry may change). Given sufficient upfront indication, a path forward could be developed to avoid impact to DWPF (e.g. design further modifications, evaporator unit operation etc.) SWPF startup will be incrementally ramped up which will allow adjustment of processing parameters and identification of potential problems. Perform COREsim modelling to further investigate impact of increased volumes of waste stream from SWPF. This will be performed as part of System Planning e.g. alternative cases etc., and also upon any indication of planning assumptions and bases changes.	Low

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
040	Salt Dissolution Results in Greater than Planned Precipitation of Gibbsite	Group 2	12.1	Very Likely	Negligible	Low	Mitigate	Methods to avoid the precipitation of gibbsite, as well as other aluminum salts, and their impacts to SWPF feed flow sheets have been evaluated. Due to the strategy and cost that would be required to remove gibbsite verses normal salt dissolution, it was determined that inclusion in flow sheets was not warranted at this time. Alternatively, the sludge batches can be blended to account for the additional aluminum content from SWPF and ARP/MCU. Investigate the use of aluminum dissolution for the removal of gibbsite. Currently, as part of the ARP/MCU program, the use of caustic addition is being evaluated for use on a batch by batch basis.	Low
041	Formation of Sodium Aluminosilicate in a Salt Tank	Group 2	12.1	Likely	Significant	Moderate	Mitigate	As part of ongoing feed qualification, flowsheets are developed and thermodynamic modeling (e.g. OLI) for salt batching performed with the goal of predicting and precluding solids formation potential and specifically allowing NAS to settle without impacting the feed preparation. Continue to monitor filter performance degradation (512-S) and coalescer performance degradation (MCU) to assess mitigation strategy effectiveness.	Low
048	Sludge Physical Properties Cause Delays in Meeting Sludge Feed Objectives	Group 2	12.1	Likely	Marginal	Moderate	Mitigate	The current program cannot feasibly sample all tanks comprehensively to establish a high confidence in physical properties of the material being removed. Each operations activity will identify the methodology to be used to handle this risk (e.g. splitting batches, SOL, Al dissolution, adjustment of wt%, etc.,). Additionally new technologies for waste removal are being investigated as part of the ongoing program. Current sludge batch planning program utilizes WCS data to evaluate processsability and minimise issues.	Low
070	Rogue Constituents in Salt Feed	Group 2	12.1	Likely	Significant	Moderate	Mitigate	As part of the current program, significant differences between future tanks and tanks tested to date are identified. As part of the salt feed qualification, bench scale tests on real waste will determine if impacts to processing will be realized. Additional risk handling strategies: Obtain processing data from ARP/MCU operation to be used in process planning for SWPF; Perform real waste testing for SWPF if ARP/MCU results indicate the potential for a problem. Evaluate the need to perform real waste sampling/testing on source tanks to prevent encountering issues during batch qualification. A window has been provided in salt batch preparation planning for transfers, sampling, analysis and qualification.	Low

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
084	Lack of Dispositioning of Failed Equipment Impacts DWPF Operations	Group 2	03.0	Very Likely	Negligible	Low	Mitigate	1) Review lessons learned from SME / Melter Replacement Outage; 2) Identify equipment to dispose as LLW; 3) Identify equipment to dispose as HLW; 4) Evaluate disposal options (cut up with shear / existing storage boxes / new storage boxes). Use of bubblers (and partial replacement), providing additional storage facilities and cutting up discarded jumpers (as far as practical) is underway. BROKK unit has been procured but has not been deployed. Limited temporary shielded storage has been provided.	Low
100	Waste Tank Utilization Conflict	Group 2	03.0	Likely	Negligible	Low	Mitigate	Continuing to improve the LWO System Planning process by: Increasing the accuracy of input data, modeling and by refinement and validation of assumptions; Identifying and resolving conflicting tank uses as any major assumptions change or as new issues arise; Working with internal and external stakeholders to communicate the System Plan and developing updates and issuing the System Plan.	Low
102	2H Evaporator Impacted by DWPF Recycle Enrichment	Group 2	12.1	Unlikely	Negligible	Low	Mitigate	Improved cleaning process is being developed.	Low
120	Sludge Batch Preparation Impacted by Slow Settling Rate	Group 2	12.1	Very Likely	Marginal	Moderate	Mitigate	As part of the current program, sludge settling data will be incorporated into the sludge batch preparation plan to minimize impacts from slow settling rates. As part of the ongoing sludge batch preparation process, evaluations are made on the need for obtaining early samples from the waste tank from which the sludge batch feed will be removed..	Low
121	Salt Dissolution Creates Greater Than Expected Volume of Salt Solution	Group 2	03.0	Unlikely	Significant	Moderate	Mitigate	Currently, before salt dissolutions are performed, lessons learned from previous salt dissolution activities are reviewed and incorporated into the proposed salt dissolution strategy. Evaluate the need to conduct additional salt characterization and perform as deemed necessary. Evaluate various methods of salt dissolution to determine most effective method.	Low
129	Slower Salt Dissolution Rates Force Schedule Delays	Group 2	05.0	Unlikely	Marginal	Low	Mitigate	As part of the program, salt dissolution campaigns are monitored and their results fed back into Program planning activities. Apply lessons learned from previous salt dissolution activities e.g. Tanks 41, 25 and 37. Evaluate various methods of salt dissolution to determine most effective method.	Low

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
214	Compliance Assessment Data Conflicts With Assumptions Upon Which 3116 WD is Based	Group 2	02.0	Unlikely	Negligible	Low	Accept	This risk is accepted based on the established process of review and discussion of assumptions by all parties. This process ensures that assumptions are clearly understood.	Low
220	Inaccuracies When Sampling for Grout Formulation in Tank 50	Group 2	12.1	Unlikely	Significant	Moderate	Mitigate	As part of the current program grout mixtures capable of producing acceptable grout that are tolerant to variations in waste feed chemistry are investigated and developed. Streams are baselined through the grout formulation and variability programs. Negative characteristics are identified early to allow chemistry correction in Tank 50 prior to reaching the bounding case of the grout formulation. Prior to SWPF being brought on line, sampling periodicity will be investigated to align with the increased amount of DSS being processed. Salt Batch planning is performed to predict Tank 50 chemistry for processing.	Low
221	Salt Baseline Characterization Different Than Forecast	Group 2	12.1	Unlikely	Marginal	Low	Mitigate	Currently, as part of the program, the salt processing strategy is adjusted as required to accommodate characterization results from salt dissolution campaigns.	Low
264	DWPF is Unable to Process SWPF Strip Effluent at Required Throughput Due to Boil off Capacity Limits	Group 2	12.1	Very Unlikely	Severe (Critical)	Moderate	Mitigate	Process enhancements are designed to provide DWPF with the capacity to handle SWPF strip effluent to support planned SWPF 9 Mgal/yr with a reasonable margin to allow for model and flowsheet uncertainty. Ensure the facility systems are able to operate at full design capacity with full steam rate to vessels. Validate that the current modifications adequately support the System Plan requirements by performing COREsim modeling (detailed water balance).	Low
289	DWPF Infrastructure Failure Forces DWPF Outage	Group 2	12.2	Very Likely	Marginal	Moderate	Mitigate	Currently, system health evaluations are performed on DWPF Zone 2 and 3 ventilation systems, repair work was identified on Zone 2 and Zone 3 ventilation and completed as part of the ongoing program. Implement recommendations of system health evaluations for all systems. Ensure critical infrastructure upgrades are identified, funded and executed. Identify critical spares for MPC crane and initiate procurement to ensure they are available should a failure occur.	Low

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
290	Interface Requirements With EPC Contractor Do Not Support Integration of SWPF (DOE Risk)	Group 2	10.0	Unlikely	Negligible	Low	Mitigate	These risks are identified and managed within the SWPF Federal Project Risk Management Plan and within SRR Risk and Opportunity Management Plan(s). SRR actions include: continuing to execute the current interface process to address interface design requirements early: Continuing involvement with SWPF design reviews. Performing CoreSim modeling to evaluate pinch points; maintaining the existing dedicated team to enhance the interface with SWPF and to ensure that all scope within Liquid Waste that is needed to support SWPF startup is coordinated and integrated to ensure timely startup and continued uninterrupted SWPF operation. SWPF Federal Project actions are documented within V-RMP-J-00001 and managed under the Federal Project Risk Management Plan. Develop a detailed integrated schedule for SRR support of SWPF tie-in, testing and startup. Additional actions under this PBS-SR-0014 ROMP are limited to ensuring salt processing capabilities should this risk be realized. Created a schedule integration team (Parsons, SRR and DOE) to focus on interface points and integration issues. Assign dedicated SRR startup resources to SWPF startup team as requested by SWPF FPD.	Low
343	Size Reduced Zeolite Cannot be Resuspended in Waste Tanks	Group 2	12.1	Very Unlikely	Negligible	Low	Mitigate	Where practical, do not transfer zeolite to any tanks with coils that do not already have zeolite present.	Low
358	Solids Build up Within Blend and Feed Tanks	Group 2	12.1	Unlikely	Marginal	Low	Mitigate	The likelihood of solids accumulation in the blend and feed tanks is reduced by the enforcement of pump suction to settled solids spacing requirements. Equipment design assists with avoiding the introduction of solids from the feed tank.	Low
363	SDF Isopar Limits Restrict ARP/MCU Salt Processing Through Tank 50	Group 2	12.1	Very Likely	Negligible	Low	Mitigate	Streamline administrative processes to isolate transfers from Tank 50 when material is determined not to meet SDF limits. Investigate raising organic limits in Saltstone through safety basis calculations. Investigate the use of temporary ventilation systems in SDUs. Perform a value Stream Analysis (VSA) Rapid Improvement Event (RIE), develop recommendations, issue report and implement recommendations of the VSA/RIE.	Low

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
364	SDUs are Not Available When Required (Project Execution Delays)	Group 2	07.0	Unlikely	Marginal	Low	Accept	Acquisition of funding and initiation of SDU projects is the subject of DOE Risks 460 and 027 respectively, therefore the handling of this risk is limited to the project execution strategy. Currently, SDU construction complete and turnover to operations milestones will be scheduled with sufficient float to allow realization of most major project risks without impacting System Plan need dates by selecting an 80% confidence level for schedule contingency.	Low
390	SDUs Not Available When Required (Operating Permit Delays)	Group 2	02.0	Unlikely	Marginal	Low	Accept	SRR works closely with SCDHEC and through DOE has a formalized process to respond to NRC questions and issues. There are no additional handling strategies that can be applied. Also utilizing lessons learned during the permitting of SDUs 2, 3 and 5.	Low
402	Beyond Current Design Basis Requirements Imposed (DOE Risk)	Group 2	01.0	Likely	Negligible	Low	Mitigate	Beyond design basis evaluations have been performed for Tank Farms and are planned for DWPF. Minor DSA changes were implemented for the Tank Farm which increased the robustness of the saftey basis.	Low
414	Higher Cs Waste in DWPF Prevents Equipment Contact Repair	Group 2	12.1	Very Likely	Significant	High	Mitigate	Design and procure an inventory of cheaper disposable pumps ("pump on a stick") prior to SWPF startup. Investigate and evaluate decontamination methods for use prior to SWPF startup.	Low
415	Saltstone Disposal Facilities (SDF) Cannot Achieve Attainment	Group 2	12.2	Unlikely	Marginal	Low	Accept	Working space will be monitored within Tank 50/SSRTs and integrated with SPF runs to maximize the available space, should an upset condition occur. This risk has been accepted for SDU 6 operation.	Low
417	Replacement Melter(s) Damaged During Storage/ Assembly	Group 2	12.2	Very Unlikely	Very Severe (Crisis)	High	Mitigate	Maintain the current strategy of storing two Melters in the same building so as not to impact DWPF production while investigating and then implementing a storage strategy where both Melters are separated such that no single fire or NPH event can significantly damage both. Add Melter security as a specific item in the interface agreement with the M&O.	Low
422	Organic Carryover in ISDP Waste to DWPF	Group 2	12.1	Unlikely	Negligible	Low	Mitigate	Perform a VSA / RIE and implement appropriate recommendations.	Low

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
424	Salt Processing Limited by Actinide Removal Capacity	Group 2	12.1	Unlikely	Negligible	Low	Mitigate	Established a Filter Improvement Team (FIT) that identified methods to improve filtration capability. Evaluate salt processing integrated flowsheet and identify improvements. Task Salt IPT to identify ARP/MCU improvements to meet 3 Mgals/yr. Install the new design filter if increased throughput is not realized. Continue processing without MST addition and evaluate performance. Further investigate processing without MST and without filtration.	Low
452	As Found Field Configurations on Old Style Tanks do not Match Technical Baseline	Group 2	03.0	Very Likely	Negligible	Low	Mitigate	Develop revised approach to investigating and documenting as-found conditions early in design process. Based on lessons learned, anticipate and allow for potential adverse as found conditions after D&R.	Low
459	Warehouse Fire Destroys Critical Equipment (Excluding Melters) (DOE Risk)	Group 2	03.0	Very Unlikely	Significant	Low	Accept	This risk has been accepted by DOE	Low
462	Increased Aluminum due to Aluminum Dissolution Creates Precipitation During Processing	Group 2	12.1	Unlikely	Significant	Moderate	Mitigate	Maximize aluminum in salt feed to allowable soluble Al in the salt batch; and add hydroxide (within Tank Farm or SWPF) prior to processing . These handling strategies should be worked in conjunction with handling strategies for Risk 251.	Low
469	Sampling Requirements at MCU Limit Planned Throughput	Group 2	12.1	Very Likely	Negligible	Low	Mitigate	Perform a VSA / RIE and implement appropriate recommendations (e.g., Reduce the need to sample each SEHT batch using process history, statistical analysis etc.; moving the point of compliance to DWPF SEFT [sample SEFT] etc.).	Low
470	Processing Higher Curie Feed Increases MCU Outage Durations	Group 2	12.1	Very Likely	Negligible	Low	Mitigate	Evaluate and implement temp mods/modifications to reduce HEPA filter loading.	Low
471	Tank 50 Cannot be Transferred to Saltstone	Group 2	12.1	Unlikely	Negligible	Low	Accept	N/A	Low

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
476	DWPF Flammability Issue Resolution Constrains Throughput	Group 2	12.1	Very Unlikely	Marginal	Low	Accept	Risk is accepted as PISA is currently being resolved.	Low
477	Multiple Flowsheet Changes Result in Processing Issues	Group 2	12.1	Unlikely	Marginal	Low	Accept	This risk is accepted as strategies to technically mature and deploy changes in a controlled manner (e.g. thorough testing in phases, gradual deployment at low throughput etc.,) have either been completed or are in place to manage this risk.	Low
483	Coatings Applied to Interiors of SDUs 2, 3, 5 and 6 are Inadequate	Group 2	01.0	Unlikely	Marginal	Low	Mitigate	Peform testing of coating for bounding case and representative case prior to SWPF operations. This will result in a lessened impact if the risk is realized.	Low
484	After Aluminum Dissolution, Remaining Aluminum Impacts Processing	Group 2	05.0	Unlikely	Significant	Moderate	Mitigate	As part of the current program, frits are investigated continually for process improvements as well as qualification for each sludge batch. Determine, through dissolution, the quantity of different forms of aluminum in the waste stream for each sludge batch. Optimize batch chemistry by investigating and employing batch management. The use of bubblers in the Melter has demonstrated some ability to relieve the melt pool heat transfer reduction due to the increased Al concentration. Also, batch management (combining F and H area sludge) is used in sludge batch planning.	Low
468	DWPF Sand Filter is Expended Before Design Life is Reached	Group 3	12.2	Very Unlikely	Negligible	Low	Accept	This risk is accepted as there are no practical measures for mitigation.	Low
403	Tank 48 Processing Takes Longer than Planned	Group 4	12.1	Likely	Negligible	Low	Accept	Risk is accepted based on performing a technical maturation plan which provides acceptable assurance of operational parameters.	Low
405	Tank 48 Processing Creates a Waste Without an on Site Disposal Path	Group 4	12.1	Unlikely	Negligible	Low	Mitigate	This risk is mitigated by following the technical maturation process (flowsheet development, testing, and if necessary testing of product to qualify processing capability of downstream facilities e.g., ESS testing, glass formulation, grout) will ensure with reasonable certainty that outgoing waste stream will meet SWPF WAC.	Low

Avoided Risks
(Sorted by Group)

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
033	Heel Removal/ Annulus Cleaning Flowsheet Interface Problems	Group 1	12.1	Unlikely	Negligible	Low	Avoid	Currently the Data Input Review Team (DIRT) process will implement team review and incorporation of sample data into WCS as part of normal ongoing activities associated with WCS to support flowsheet development. Heel removal technologies have been developed and are being improved (e.g. additional mixing pumps can enhance mechanical cleaning). Bulk oxalic acid flowsheet to reduce the amount of oxalates produced has been issued but overall compliance with System Plan 20 requires further analysis for oxalate destruction or elimination. This analysis will be performed as part of the tank cleaning preparation. Investigation and development of a flowsheet minimizing oxalate production for each specific tank to undergo OA cleaning is performed as part of the current program. Model downstream impacts from oxalates in the overall HLW flowsheet as part of the planning process.	Zero
332	DWPF Facility Impacts Due to Additional Shielding Needs	Group 1	01.0	Very Likely	Negligible	Low	Avoid	Continue shielding evaluations and develop a strategy which combines administrative controls and shielding and prepare to implement this strategy during an appropriate DWPF outage(s). Implement Lab Waste Handling modifications.	Zero
401	Exec. order (#13514) Requires Facilities Reduce Greenhouse Gases (DOE Risk)	Group 1	02.0	Non-Credible	Negligible	Low	Avoid	It is not considered credible that this risk will impact the PBS-SR-0014 Program, however it may impact other activities at SRS. To avoid this risk entirely, it has been raised to a site level for handling.	Zero
420	Saltstone Grout Pump Cannot Deliver Grout to SDUs	Group 1	10.0	Unlikely	Marginal	Low	Avoid	Investigate the grout delivery system to each SDU and ensure the design has sufficient capacity to pump grout to the final disposition point. Include necessary modifications in each SDU project to ensure the field deployment is successful. Develop a System Plan with sufficient contingency space available in previous SDU to avoid "just in time" delivery of disposal facilities.	Zero

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451	Site Utility Outage (DOE RISK)	Group 1	10.0	Likely	Marginal	Moderate	Avoid	DOE/Ameresco will avoid the risk of steam supply failure at a site level with the addition of a redundant biomass plant and non-co-located package boiler. To ensure reliable infrastructure is maintained in response to PBS needs, SRR will incorporate lessons learned actions resulting from analysis of the January 2014 steam outage event. Table top drill has been performed.	Zero
454	Gas Retention in Waste Impacts Bulk Waste Removal	Group 1	12.1	Very Likely	Marginal	Moderate	Avoid	Incorporate lessons learned (e.g. develop reasonable control set options ahead of BWR), provide contingency within the BWR schedule and/or System Plan to accommodate additional allowance for realizing this risk.	Zero
481	Downstream Flowsheet Impacts from TCCR Ion Exchange Media	Group 1	12.1	Very Unlikely	Negligible	Low	Avoid	Develop a Waste Incidental to Reprocessing (WIR) case for the disposition of the spent media off site and ship to a processing/disposal facility.	Zero
116	2H Evaporator Material and Chemical Balance Issues	Group 2	12.1	Likely	Marginal	Moderate	Avoid	Make ready a back up strategy to transfer Tank 22 material to an alternate tank and then utilize Tank 22 for up to 6 months to receive and store DWPF recycle until flowsheet issues are resolved. Evaluate and implement SRR proposal initiatives for DWPF recycle reduction. Evaluate opportunities to remove solids from DWPF recycle.	Zero
166	TiO2 Limits Within DWPF WAC Cannot be Sufficiently Raised to Support Salt Processing	Group 2	12.1	Unlikely	Very Severe (Crisis)	High	Avoid	Salt batches will be planned to minimize the amount of MST required where possible (this will only marginally help mitigate this risk). During processing, tailor the MST usage to the salt batch and tailor double strike to reduced titanium loading in each batch. Include these changes into operating procedures. This risk may be avoided by the development of glass formulations capable of higher Ti loading. Investigate, test and develop a modified SWPF flowsheet to use mMST.	Zero
176	Volume of Canyon Waste is Greater Than Planned (DOE Risk)	Group 2	10.0	Very Unlikely	Marginal	Low	Avoid	The volumes of waste to be received from the Canyon is a Memorandum of Understanding based agreement (FSA) and a baseline change would be required if they were to change.	Zero
366	More Pu is Required to be Dispositioned in Sludge Batches (DOE Risk)	Group 2	10.0	Likely	Severe (Critical)	High	Avoid	The disposition of additional Pu will be a System Plan change and the PBS baseline will undergo change control to include the additional scope which essentially avoids impact by triggering baseline change control. There is no residual risk or contribution to contingency from this risk.	Zero

Risk ID	Risk Title	Group	Category	Likelihood	Consequence	Initial Risk Level	Handling Strategy	Risk Handling Strategy Description	Residual Risk Level
394	New Waste Stream to Tank Farms (DOE Risk)	Group 2	10.0	Likely	Significant	Moderate	Avoid	The existing program has processes in place to evaluate new waste streams and downstream impacts to waste processing. The Liquid Waste program has a Memorandum of Understanding based agreement (FSA) and a baseline change may be required if a new waste stream were introduced.	Zero
431	No Disposal Path Exists for Spent Solvent from SWPF	Group 2	02.0	Unlikely	Marginal	Low	Avoid	Perform analysis of solvent waste to better characterize waste (SWPF Project). Finalize solvent waste disposition path forward for lifecycle of SWPF.	Zero
421	Glass Waste Storage is not Available After GWSB #2 is Filled (DOE Risk)	Group 3	10.0	Unlikely	Marginal	Low	Avoid	The System Plan has projected a reduced canister production to already minimize the impact of this event. Additionally, to avoid this risk, investigate alternate storage (e.g. double stacking, interim storage options), develop a strategy and deploy to avoid this impact.	Zero
460	SDUs are Not Available When Required (Acquisition Delays) (DOE Risk)	Group 3	11.0	Very Likely	Significant	High	Avoid	Ensure SDU project acquisition strategy identifies the appropriate fiscal period to submit project data and begin acquisition. Provide sufficient allowance for budget perturbations e.g. continuing resolutions. Investigate the practicality of deploying a smaller SDU which will require a reduced funding profile and provide a "stop gap" measure to deployment of a large SDU. If practical develop a decision point within the SDU deployment strategy to ensure design of a smaller SDU can be intitiated and deployment can be achieved in time to avoid any impact.	Zero
388	Analytical Resource Limitations Prevent Meeting Baseline Schedule	Group 4	03.0	Likely	Severe (Critical)	High	Avoid	Determine adequacy of existing SRNL capabilities and define requirements through approval of Liquid Waste Tank Residual (LWTR) Sampling Assurance Program Plan (SAPP) and LWTR Quality Assurance Program Plan (QAPP) (striving to align requirements with existing capabilities). Look for cost effective alternative to levelize the sample analysis need (e.g. SWPF, MOX). Develop through sample data (established in the earlier tank closures), a less extensive sampling requirement which eases the pressure on laboratories. Once the capability has been maximized, adjust the system plan to match the capability. This risk will be avoided once capability has been verified.	

APPENDIX D – Opportunity Summary Table

(Sorted by Post-handling Opportunity Level)

Opp ID	Opportunity Title	Group	Category	Likelihood	Benefit	Opportunity Level	Handling Strategy	Opportunity Handling Strategy Description	Opportunity Level (Post-handling)
173	Feedback from Technical Successes to DOE Complex (DOE Opportunity)	Group 1	12.1	Very Likely	Significant	High	Accept	Currently several mechanisms exist and are being exercised to share technical information e.g. Tank Waste Corporate Board, also ad-hoc technology exchanges are continuing as part of ongoing business (e.g. Waste Management Conference, EM-TEG, EM-TD Program, SRR hosted exchanges etc.). Moving expertise to sites temporarily/permanently: bringing in expertise from other sites; Chief Engineer regularly scheduled telecons. Technologies developed are being shared between sites. Position of Technology Officer has been established within SRR.	High
226	Influent Reductions	Group 2	10.0	Likely	Exceptional	High	Accept	As part of the current program, flowsheets are reviewed to identify and implement methods to minimize waste volumes sent to the Tank Farms. Results of these ongoing reviews feed the System Plan and feedback is provided to the M&O for Canyon operations planning. Investigate potential reductions in internal water additions (e.g. rainwater, evaporator flushing etc.). Evaluate the need to initiate a formal study during annual updates based on plant condition.	High
393	Operation of NGS at Higher Sodium Molarity	Group 2	12.1	Likely	Exceptional	High	Enhance	Investigate further processing at a higher Na molarity and develop a path forward for testing using full-scale equipment and validation before deployment. Perform alternative analysis to identify a recommended facility modification to permit switching flowsheet to NGS and provide direction to EPC to begin implementation by performing a conceptual design.	High
428	Remove/Relieve Design Constraints on SDUs Based Upon Maturing Performance Assessment	Group 3	02.0	Likely	Exceptional	High	Enhance	Performed reviews to identify areas of conservatism in the PA which are candidates for relaxation based on field data and /or the application of optimized analysis techniques. Further perform a Special Analysis (SA) targeting the areas identified for highest potential benefit. Obtain DOE approval of SA. Use the results of SA to modify the design constraints for future SDUs.	High

Opp ID	Opportunity Title	Group	Category	Likelihood	Benefit	Opportunity Level	Handling Strategy	Opportunity Handling Strategy Description	Opportunity Level (Post-handling)
453	Perform Interim Salt Processing Without an MST Strike	Group 2	12.1	Very Likely	Exceptional	High	Enhance	A pilot no MST processing campaign is currently underway. Based on the results of this campaign, ensure regulators understand the benefit from proceeding with this processing strategy and gain concurrence from DOE to process without MST strikes for the remainer of MCU operation. Once concurrence is received, reconfigure interim salt processing to bypass actinide strike. Further investigate the feasibility of further performing interim salt processing without filtration.	High
482	Deploy TCCR on Multiple Tanks to Accelerate Tank Closure	Group 3	12.1	Likely	Exceptional	High	Exploit	Develop a business case and deploy/redeploy TCCR on additional tanks.	High
208	Improvements in Waste Removal	Group 2	12.1	Likely	Significant	Moderate	Enhance	Reviews of the results of waste removal activities/lessons learned have identified and are continuing to identify improvements for improving waste removal (Those that would reduce the amount of liquid additions and speed up the waste removal process, reduce the cost of waste removal equipment or operation and plan development of those improvements e.g. recirculation techniques, use of other waste streams). Investigate and deploy mixing techniques with limited material (level of several inches only) within the tank.	High
224	Improvements in Closure	Group 2	12.1	Likely	Significant	Moderate	Enhance	It has been established as part of the SRR program that DOE complex-wide conferences are attended by representatives from SRS to share knowledge, experiences and improve the ability to execute the closure program. Examine data, lessons learned and explore opportunities for technical improvements in closure activities. Apply LEAN techniques to streamline the closure documentation process and field implementation. Streamlining of sample analysis by SRNL could be employed. Modify tank isolation and grout formulation approach in Consolidated General Closure Plan (for both Tank Farms).	High

Opp ID	Opportunity Title	Group	Category	Likelihood	Benefit	Opportunity Level	Handling Strategy	Opportunity Handling Strategy Description	Opportunity Level (Post-handling)
227	Waste Characterization Improvements	Group 2	12.1	Likely	Marginal	Moderate	Enhance	Investigate, develop and deploy new and improved tools to augment the current waste characterization program. Develop and validate a WCS upgrade to facilitate automatic projection of waste stream compositions based on planned transfer modeling. Improvements in WCS could help handle other risks where waste compositional variances and unknowns exist.	High
384	Develop Approved Final Disposal Paths for DWPF Failed Equipment	Group 2	10.0	Unlikely	Significant	Moderate	Share	Evaluate this opportunity as an inter-PBS opportunity. By allowing the final disposition early, the life cycle of the final SRS closure PBS would be reduced. Review possibility of dispositioning DWPF Melter in a prequalified transportation box as LLW.	Moderate
389	Reduce Future Closure Requirements	Group 2	02.0	Likely	Significant	Moderate	Exploit	The data required to support the arguments for reducing requirements is currently being gathered and will continue being gathered. MEP decisions and their bases are being refined as the full cost (safety, exposure, downstream processing, etc.) and benefits gained are more fully understood. Sampling requirements may be able to be reduced based on historical data.	Moderate
423	Higher Molarity Sludge Processing	Group 2	12.1	Likely	Marginal	Moderate	Enhance	After alternate reductant deployment, review each sludge batch preparation plan to identify the potential of reducing washing activity to allow this opportunity to be realized.	Moderate
438	Salt Dissolution Creates Less than Expected Volume	Group 2	12.1	Very Unlikely	Exceptional	Moderate	Accept	N/A	Moderate
456	Spread Cement Bags Evenly in Vault 4	Group 1	02.0	Likely	Marginal	Moderate	Exploit	Develop a technical, regulatory and business case to allow the cement bags to remain within Vault 4.	Moderate
473	Remove Interior Coating Requirement from SDU Design	Group 2	01.0	Likely	Significant	Moderate	Exploit	Perform R&D to determine the actual effect of sulphate attack to SDU structure. The goal of this investigation is to develop a position (utilizing modeling) that the attack is insignificant and a coating is not required. As an alternate strategy, perform preliminary investigations into the feasibility of developing a grout recipe and controls to limit sulphate levels to below which a protective coating is no longer required. To fully exploit this opportunity, the requirements to build and successfully test a leak free tank without the use of an interior coating or liner systems must be determined (First of a kind SDU 6 did not achieve this condition).	Moderate

APPENDIX E – Risk and Opportunity Assessment Forms

ACTIVE RISKS

PBS SR-0014

Risk Assessment Form

ID Number: 011 **Revision:** 11 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Tank Farm Infrastructure/Equipment Failure (Not Including Transfer Lines or 3H Evaporator)		
Type: Risk, Internal, Technical	**Category:** Process Performance - Equip./Infrastr.Failures	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: SRR-OPS	**Contact:** Mike Borders	**Date Identified:** 4/3/2006

Statement of Event: Tank Farm facilities are outdoor facilities with major equipment and infrastructure exposed to extreme weather and/or harsh radiological conditions. A large number of utility systems are routed deep underground within the Tank Farms. The material condition of equipment and infrastructure (much of it constructed from the early 1950's to the late 1970's) is deteriorating (e.g. corrosion [Hg and other corrosive species]). A risk exists that the failure of key major pieces of equipment (e.g., pumps, pump tanks, evaporator vessels, motor control centers, etc.) or failure of utilities (e.g. those portions of air, steam, water and power supply systems etc., owned by the Tank Farms) can cause unplanned facility outages.

Likelihood:	Very Likely	**Basis:** Due to the harsh environment of the Tank Farm facilities, equipment failure is a reality of facility operations. The age of utility systems (e.g. air, steam, water and power supply systems) is such that in many cases design life has been exceeded and deterioration has begun. Underground utilities which have been removed due to failure exhibit significant degradation. Plant Air System currently requires supplemental compressors to ensure pressure is maintained due to leaks in degraded distribution system. As the Tank Farm infrastructure and equipment ages in the remaining 24 years of the Program, regular maintenance will become less effective at combating system unplanned outages due to degraded components (especially those which are buried below grade) and frequent outages are very likely.
Consequence / Benefit:	Severe (Critical)	**Basis:** The worst case failure would be an underground utility. A major failure of the chromate system would result in halting Tank Farm processing for up to 6 months. Failure of a key piece of equipment, such as a cooling tower, evaporator pot (other than 3H) or 3H evaporator feed pump, would shut down the associated evaporator system by an estimated 6 months. Each outage would halt salt processing (interrupting feed prep/supply from Tank Farm) or sludge processing (sludge batch preparation/transfer). As the Tank Farm infrastructure ages in the remaining 24 years of planned operation multiple outages will occur. In the worst case, cumulatively these outages could result in up to five years impact to the Program. Equipment repair and replacement could cost up to $20M.

Most Significant Cost Impact ($k): 3,270,000	**Most Significant Schedule Impact :** 5 Yrs

Level:	**High**	**Event Trigger:** Currently open; Close on completion of PBS.
Handling Strategy:	Mitigate	**Description:** Currently the evaluation of system health of key systems is performed for the HTF and FTF facilities, needed spares are identified, and procurement initiated, however funding restrictions can result in not being able to obtain spares as needed (see funding risk 027). The procurement of spares will be "prioritized" to establish visibility and ensure effective use of funding is maintained. In addition to these already established programs, HTF East Hill Utility Services Upgrades have been initiated and should be planned and funded for completion. Ensure that Infrastructure maintains the appropriate visibility on the Critical Infrastructure IPL. Develop "stop-gap" measures that can be deployed to minimize impact of failure (e.g. temp mods). Develop operating strategies which provide tank space to receive recycle (e.g. schedule solids removal campaigns more frequently from Tank 22) and other streams to enable the HLW facilities to maintain operation when infrastructure failures occur.

Handling Strategy Action Items:

011.1 Perform a review of the Critical Infrastructure IPL to ensure all critical infrastructure is included and the need for replacement clearly identified., Guy Campbell

HS Implementation Cost ($K):	0	**Basis:** Tank Farm East Hill upgrades are planned, but not fully within the current funding, however some upgrades are being performed to support new projects/operations activities. Funding for spare parts and equipment is often reduced due to budget restrictions See Risk 027. This would impact ability to implement risk handling strategy.
HS Implementation Schedule:	0	**Basis:** Completed within System Plan schedule baseline.
Other Handling Strategies: Another strategy would be to re-introduce the strip effluent from SWPF or ARP/MCU back into Tank Farm storage. System Plan Revision 20, base case does not project a need to develop a sludge modifier flowsheet as salt processing and sludge processing complete simultaneously. Previously in System Plan Revision 19 sludge was consumed prior to completion of salt processing which allowed sludge feed breaks to be mitigated by the use of sludge modifier to maintain SWPF production. This rationale is no longer effective as a sludge modifier flowsheet is no longer planned and an impact to sludge processing is a direct impact to Program completion. If at a later date the use of sludge modifier is again forecast as being required, this may be a viable risk handling strategy. Reduce pressure on system performance by eliminating DWPF recycle (or solids within DWPF recycle).		

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Risk Assessment Form

ID Number: 011 **Revision:** 11 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: Failure of a key piece(s) of equipment still expected.

Residual Likelihood:	Very Likely	**Basis:** Likelihood of failure of a key piece of equipment has been reduced but remains very likely.
Residual Consequence:	Significant	**Basis:** In the worst case, impact from Evaporator failure would be greatly reduced by having tank space. Additional available spares and planned replacement reduce the impact of individual equipment failure. In the worst case, cumulatively outages could result in up to 1 year impact to the Program. Equipment repair and replacement could cost up to $20M.
Residual Risk Level:	**High**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 1,000	**Most Likely** 2,000	**Worst Case** 5,000
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

Worst Case: $5M cost of replacement of a major piece of equipment.

Most Likely Case: $2M cost of equipment replacement.

Best Case: $1M cost of equipment replacement.

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 55,000	**Most Likely** 329,000	**Worst Case** 665,000
Residual Schedule Impact :	1 Mth	6 Mths	1 Yr

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: 1 year Program delay and $15M cost of replacement of a major pieces of equipment.

Most Likely Case: 6 months Program delay and $4M cost of equipment replacement.

Best Case: 1 month Program delay and $1M cost of equipment replacement.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 56,000	**Most Likely** 331,000	**Worst Case** 670,000
Residual Schedule Impact :	1 Mth	6 Mths	1 Yr

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on total life cycle.

Risk Assumptions :

30. Sufficient tank space volume is available to support the projected receipt of HLW into Tank 39 from H-Canyon operations through FY25. LLW waste, mainly from the General Purpose (GP) Evaporator, dispositioned in SPF are received into Tank 50 and direct discards of Pu and neptunium materials to the DWPF feed system are received into Tank 40, or Tank 51.

31. Tank Farm feed preparation infrastructure modifications required to support SWPF processing rates including:

-H-Tank Farm Blend tanks readiness for salt solution preparation

-F-Tank Farm Blend tanks readiness for salt solution preparation

-Tank 49 readiness as SWPF feed tank

-Mixing capabilities

-Enhanced transfer capabilities

-Transfer routes provided to feed tank.

Event Comments: Other sludge feed break risks share the handling strategy to provide an early capability to switch to sludge simulant.

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Risk Assessment Form

ID Number: 012 **Revision:** 09 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Event Title: DWPF Equipment Failure (Excluding Melter)			
Type: Risk, Internal, Technical	**Category:** Process Performance - Equip./Infrastr.Failures	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste		
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations		
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 4/3/2006	

Statement of Event: DWPF has been in radioactive operation for 20 years and has produced 4000+ canisters. DWPF is expected to produce approximately 4300 additional canisters before mission completion. A risk exists that the lack of adequate equipment spares could lead to degraded facility performance and decreased canister production rates. (Melter associated risks are addressed separately).

Likelihood:	Very Likely	**Basis:** Failure of remote canyon process equipment is expected to occur on a frequent basis (particularly equipment that comes in contact with the abrasive frit/waste slurry). To date all necessary spares have been procured with the exception of a vessel to be used as a replacement for SME/MFT/SRAT. Funding limitations have placed the procurement of this vessel on hold. (Refer to risk 027). This risk is therefore bounded to a failure of the SME, SRAT or MFT at this point in time. A failure of the SME vessel has been encountered once during DWPF operations.
Consequence / Benefit:	Significant	**Basis:** Failure to maintain critical spare equipment in an acceptable readiness state could cause canister production downtime of up to 1 year. Cost to replace a SME/SRAT/MFT is estimated at $10M (e.g. a remote process vessel for which no spare is currently available which will also include cost to remove failed vessel and install a procured replacement).

Most Significant Cost Impact ($k): 660,000 **Most Significant Schedule Impact :** 1 Yr

Level:	**High**	**Event Trigger:** Currently open; Close on completion of DWPF operations.
Handling Strategy:	Mitigate	**Description:** The current program replenishes assembled unit spares, revalidates present list of equipment identified to be maintained as spares and verifies that minimum quantity of spares are maintained on hand and procured as needed, however, reduced funding levels may impact these activities (see risk 027). The procurement of spares will be "elevated" to establish visibility and ensure correct prioritization of funding is maintained. In addition to these already established programs, system life extension will be investigated. Failure analyses are being performed on failed equipment to identify solutions to any weaknesses in design. Incorporate lessons learned to increase longevity of components.

Handling Strategy Action Items:

012.1 Replenish remaining unit spares. (a single vessel for use as a spare for either SME, SRAT or MFT)., George Matis

HS Implementation Cost ($K):	0	**Basis:** No cost impact.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: None

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Risk Assessment Form

ID Number: 012 **Revision:** 09 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Statement of Residual Risk: Even after adequate spares are procured, the failure of equipment can still occur.

Residual Likelihood:	Very Likely	**Basis:** Based upon the 22 years of remaining operation of DWPF, the potential for equipment failure remains very likely.
Residual Consequence:	Marginal	**Basis:** After spares are available, the failure of a SME vessel would impact the program 3 months while it is replaced. Near-term residual impact of $10M to procure and install a new SME vessel.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 500	**Most Likely** 1,500	**Worst Case** 10,000	Near-term residual risk for all cases is the cost to procure and install a new equipment spare. Worst Case: Vessel ($10M) Most Likely Case: SME coil ($1.5M) Best Case: Minor equipment $500K
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 54,000	**Worst Case** 163,000	Worst Case: After spares are available, the failure of a SME vessel would impact the program 3 months while it is replaced. Most Likely Case: A failure occurs which is not a major vessel and requires 1 month to replace. Best Case: Failure occurs, but no impact is felt as a planned outage can be utilized for replacement.
Residual Schedule Impact :	0	1 Mths	3 Mths	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 500	**Most Likely** 55,500	**Worst Case** 173,000	Residual impact based on total life cycle.
Residual Schedule Impact :	0	1 Mths	3 Mths	

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments: The risk of a premature DWPF melter failure is addressed under Risk 021. The failure to provide a spare DWPF melter is addressed under Risk 022. This is an interface risk with the DOE-SR SWPF Project during the first year of operations.

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Risk Assessment Form

ID Number: 018 **Revision:** 11 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Event Title: Saltstone Processing Facility (SPF) Cannot Achieve Attainment		
Type: Risk, Internal, Technical	**Category:** Process Performance - Equip./Infrastr.Failures	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 5.1	**Assessable Element Title:** Grout Encapsulation of Waste	
WBS Number: 01.90.03.01	**WBS Title:** Saltstone Operations	
Responsible Org: SRR-ENG	**Contact:** Eric Freed	**Date Identified:** 4/3/2006

Statement of Event: Attainment of SPF is predicted and used to establish System Plan processing goals. A risk exists that equipment failure(s) or process upsets impact processing.

Likelihood:	Very Likely	**Basis:** The Saltstone process is inherently vulnerable to single component failures due to the absence of redundancy of critical systems and components in the design. Components considered essential to keeping the production systems operating include: Salt Feed Tank, Saltstone Grout Mixer, Saltstone Grout Hopper, Overflow Container, Saltstone Grout Transfer Pump, Drain Water Return System Pump, High Pressure Flush Pump, Dry Material Storage and Handling Equipment, and associated valves, instruments, and transfer lines. Operating experience (run hours) limits the amount of data that can be used to predict equipment failure. During peak demand on SPF (i.e. with SWPF in operation) a spare mixer will be on hand, however an infant mortality could occur.
Consequence / Benefit:	Negligible	**Basis:** Assuming the worst case (i.e. system rock up), the pressure relief device would rupture, diverting material to the SHOC (overflow tank) as the process is shut down. Without being able to completely de-inventory the hopper, mixer, and grout pump, the scope of recovery becomes the majority of the process room equipment and grout line. A spare mixer, transfer pump and other critical equipment are on hand. Delay could be up to 2 months and cost up to $2.5M (new mixer $1.5M; new pump $200K; plus other miscellaneous replacement equipment). Worst case assumes this event occurs during SWPF salt processing.

Most Significant Cost Impact ($k): 110,500 **Most Significant Schedule Impact :** 2 Mths

Level:	**Low**	**Event Trigger:** Open - Resumption of saltstone processing; Close - completion of saltstone operations.
Handling Strategy:	Mitigate	**Description:** Currently performing system health evaluations and ensuring adequate spare parts/equipment are identified and on hand to support facility operations is part of ongoing operations. The procurement of spares is "prioritized" to establish visibility and ensure correct prioritization of funding is maintained. Investigation of methods to mitigate the impact of a Saltstone unplanned outage has been performed and the integration of facilities response to a SPF outage is an ongoing process. In addition to these already established programs, an improved system health program has been implemented. Performed investigation, evaluated and recommended improvements to achieve enhanced capacity and reliability (Enhanced Low Activity Waste Disposal - ELAWD Phase 2).

Handling Strategy Action Items:

018.15 Include Phase 2 of ELAWD improvements in the baseline., Keith Harp

HS Implementation Cost ($K):	0	**Basis:** Currently Planned or within the baseline.
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies: A second line could be deployed as a backup, but is not currently planned. Build a solidification facility; Receive DSS; Solidify DSS; Ship solid product to NTS; and dispose of solid product at NTS. Acting on Energy Solutions (ES) proposal to take SRR DSS per an existing design, this capability could be available 18 months after ES receives funding. A review of available cost data suggests that this idea will not save money and may introduce an additional risk in regulatory space.

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Risk Assessment Form

ID Number: 018 **Revision:** 11 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Statement of Residual Risk: A risk remains that equipment failure(s) or process upsets impact processing. This would be exacerbated if ELAWD modifications were not as successful as planned at improving SPF attainment.

Residual Likelihood:	Unlikely	**Basis:** System health evaluations and feedback into predictive and preventive maintenance reduces the likelihood of unexpected failures. Likelihood will be reduced by the implementation of ELAWD Phase II. However, the facility has yet to prove that it can reliably maintain the required throughput to support the System Plan peak demand.
Residual Consequence:	Negligible	**Basis:** Assuming the worst case (i.e. system rock up), the pressure relief device would rupture, diverting material to the SHOC (overflow tank) as the process is shut down. Without being able to completely de-inventory the hopper, mixer, and grout pump, the scope of recovery becomes the majority of the process room equipment and grout line. A spare mixer, transfer pump and other critical equipment are on hand. Delay could be up to 2 months and cost up to $2.5M (new mixer $1.5M; new pump $200K; plus other miscellaneous replacement equipment). Worst case assumes this event occurs during SWPF salt processing.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 2,500	**Worst Case** 2,500	Worst Case: Cost of replacement spares $2,500K Most Likely Case: Cost of replacement spares $2,500K Best Case: Cost of replacement spares $0.
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 108,000	**Worst Case** 108,000	Worst Case and Most Likely Case: 2 Month outage to replace equipment. Best Case: Equipment can be repaired. No impact.
Residual Schedule Impact :	0	2 Mths	2 Mths	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 110,500	**Worst Case** 110,500	Residual impact based on total life cycle.
Residual Schedule Impact :	0	2 Mths	2 Mths	

Risk Assumptions :

18. During SWPF operation:

-SPF and SDF will support SWPF processing rates

-Additional operational time (i.e., multiple shifts, additional operating days each week, etc.) and adequate SDU receipt space to match production streams from SWPF are planned

-Modifications will provide sufficient contingency storage capacity to minimize impacts to SWPF or ETF due to SPF or SDF outages.

Event Comments: This is an interface risk with the DOE-SR SWPF Project during the first year of operations.

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Risk Assessment Form

ID Number: 021 **Revision:** 12 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Event Title: Replacement DWPF Melter Failure			
Type: Risk, Internal, Technical	**Category:** Process Performance - Equip./Infrastr.Failures	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste		
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations		
Responsible Org: SRR-ENG	**Contact:** Eric Freed	**Date Identified:** 4/3/2006	
Statement of Event: Melter 3 is planned to operate for approximately 8 yrs. Melter 2, is assumed to be replaced in June 2017 after an operational life of approximately 13 years. A risk exists that a melter is changed out at the end of its life, but the replacement melter prematurely fails.			
Likelihood:	Likely	**Basis:** Based on previous melter history and industry experience of infant mortality in complex equipment, it is likely during the Program a replacement melter will fail prematurely. Additionally after passing the initial period of operation, the melter could perform as required, yet could fail due to service wear.	
Consequence / Benefit:	Marginal	**Basis:** Operational planning has established a melter operational life expectancy of a minimum of 8 years with an assumed 4 month melter replacement outage. Premature failure of a replacement melter would necessitate an earlier than forecast installation of the next replacement melter. Melter 4 is included in the current plan along with necessary storage boxes (FESVs to house Melter 3 after it's replacement are scheduled to begin construction once Melter 3 is installed; workarounds are available to temporarily store a failed Melter 3 until construction is complete, e.g. Laydown Cell after disposition of failed SME currently stored in laydown space). This melter is scheduled to be available prior to the planned installation of Melter 3. This timeframe will provide Melter 4, and available storage box and FESV in time for replacing Melter 3 should it undergo an infant mortality shortly after its planned installation in June 2017. The impact of this event would be limited to the downtime due to the replacement of Melter 3 with Melter 4. This is estimated at 4 Months. An additional duration (4 Mths) will be added to investigate the failure mode of Melter 3 and avoid this on Melter 4. The duration of 4 months is based on correction of an electrical or an external mechanical issue.	
Most Significant Cost Impact ($k): 433,000		**Most Significant Schedule Impact :** 8 Mths	
Level:	**Moderate**	**Event Trigger:** Open on restart of DWPF after Melter 2 replacement; Close on completion DWPF operations.	
Handling Strategy:	Mitigate	**Description:** Currently, as repairs are needed on the melter, techniques are developed and procedures issued to allow repairs. These procedures, techniques and specialized equipment etc., are maintained for future use. A program currently exists for monitoring system health and the results of the program are incorporated into future melter fabrication, (e.g. use of insert in pour spout). An active program is maintained for remote repair of cooling water leaks (a known potential for early melter failure). Develop (as far as practical) a strategy, recovery schedule and work packages for removal of Melter 3 upon encountering a premature failure.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** No additional cost.	
HS Implementation Schedule:	0	**Basis:** No impact to current baseline schedule.	
Other Handling Strategies: As required, initiate the procurement of future replacement melters.			

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Risk Assessment Form

ID Number: 021 **Revision:** 12 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Statement of Residual Risk: The scheduled replacement of DWPF melters is incorporated in the operating cost baseline. The risk remains that an infant mortality of Melter 3 may occur.

Residual Likelihood:	Likely	**Basis:** It remains likely that a premature failure of a replacement melter could occur.
Residual Consequence:	Marginal	**Basis:** Replacement melter fails and the next replacement is installed after troubleshooting cause of infant mortality and correcting any of these issues with the replacement Melter. This would be an 8 Mth impact.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 163,000	**Worst Case** 433,000	Worst case: Replacement melter fails and the next replacement is installed after troubleshooting cause of infant mortality and correcting any of these issues with the replacement Melter. This would be an 8 Mth impact.
Residual Schedule Impact :	0	3 Mths	8 Mths	Most likely Case: Replacement melter fails and repair is effected within 3 months (minimal cost). Best case: Failure can be worked around (i.e. repaired) without impact.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 163,000	**Worst Case** 433,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	0	3 Mths	8 Mths	

Risk Assumptions :

10. An operational spare melter is to be available when a melter is replaced to mitigate the risk associated with "infant mortality."

11. A six-month DWPF outage, beginning July 2017, is required for SWPF tie-ins immediately prior to SWPF becoming operational. During this outage DWPF plans to implement productivity enhancements to support increased influents from SWPF. Note that this outage is coincident with the four-month melter outage.

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments: To manage this risk it is recommended that two spare melters be available at all times. This ensures a spare is available at the most critical time, i.e. during the startup of a newly installed melter. This would require maintaining two spare melters. As melters are a consumable commodity, this could be considered as performing procurement early at minimal additional long term cost.

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Risk Assessment Form

ID Number: 027 **Revision:** 10 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Program (PBS-SR-0014) Funding Impacted by Competing Priorities (DOE Risk)			
Type: Risk, External, Programmatic	**Category:** Resources/Conditions	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: DOE-SR	**Contact:** Soni Blanco	**Date Identified:** 3/30/2006	
Statement of Event: Funding Priorities within Federal Budgetary process change. These changes result in impacts to funding availability for PBS-SR-0014.			

Likelihood:	Very Likely	**Basis:** Due to the challenging Federal budget opportunities, changing funding priorities are a reality based on a review of Projects and Operating expenses required by the System Plan. Potential near-term budget shortfalls may threaten to place some scopes of work on hold (e.g., SDI, waste removal preparation, tank closure). Additional funding is required, starting in FY18 to allow closure of Tanks 10 and 15. This increase is not currently planned.
Consequence / Benefit:	Very Severe (Crisis)	**Basis:** The program life cycle is based on having the funding available when needed. Underfunding and/or untimely funding of PBS-SR-0014 results in delays to program completion, resulting in additional environmental and programmatic risks and life cycle costs. It is estimated that this funding competition could have up to a crisis impact on the program. Additional near-term costs are incurred in re-establishing procurement cycles for projects/operations activities placed on hold due to funding shortfalls. Significant costs will be incurred due to demobilization and remobilization of the skilled workforce as projects are de-staffed and placed on hold to be later re-started.
Most Significant Cost Impact ($k): N/A		**Most Significant Schedule Impact :** N/A
Level:	**High**	**Event Trigger:** Currently open; Close on completion of PBS.
Handling Strategy:	Mitigate	**Description:** Funding is requested with significant justification to support operations activities and projects (including consequences of not executing operations activities and projects). Communicate impacts if early funding is not available and monitor change after receiving funding. SRR currently develops funding strategies to support meeting the System Plan. System Plan adjustments are identified to compensate for funding shortfalls. If it is determined adjustments are required, the System Plan will either be revised and/or projects/operations activities will be extended or cancelled. Execute cost savings initiatives (iACT) and schedule approved initiatives in P6 for execution. Established Mission for Excellence Group to use lean tools to identify improvements in execution processes (e.g. VSA, RIE).
Handling Strategy Action Items:		
HS Implementation Cost ($K):	0	**Basis:** In the baseline.
HS Implementation Schedule:	0	**Basis:** Completed within System Plan schedule baseline.
Other Handling Strategies: Implement plan for suspension/resumption of activities after momentary operations activity or project shutdown to a safe condition should there be no funding available during execution.		

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Risk Assessment Form

ID Number: 027 **Revision:** 10 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: To ensure that the original risk handling strategy was effective, a change control process will be utilized to monitor baseline changes, e.g. Baseline Change Control (BCP). It is assumed that projects/operations activities will be adequately funded throughout the life of the program as a result of utilizing change control. There is no credible, feasible way to determine the impact this could have on the program without knowing when the funding shortfall would occur, the duration, and the magnitude. Assumes funding impact is early in the program and of a duration and magnitude to cause a delay in LWO system closure such that original projected cost savings for accelerated closure are lost.

Residual Likelihood:	Very Likely	**Basis:** Even with monitoring and change control, budget shortfalls will occur.
Residual Consequence:	Very Severe (Crisis)	**Basis:** System Plans will have to be revised to align with defined budgets. If this risk is realized, change control will be exercised on the System Plan execution to accommodate the realized risk, there is no contribution to T&PRA. The residual risk values are entered in life cycle impacts for grading purposes only.
Residual Risk Level:	**High**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** N/A	**Most Likely** N/A	**Worst Case** N/A	If this risk is realized, change control will be exercised on the System Plan execution to accommodate the realized risk, there is no contribution to T&PRA.
Residual Schedule Impact :	N/A	N/A	N/A	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** N/A	**Most Likely** N/A	**Worst Case** N/A	If this risk is realized, change control will be exercised on the System Plan execution to accommodate the realized risk, there is no contribution to T&PRA.
Residual Schedule Impact :	N/A	N/A	N/A	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** N/A	**Most Likely** N/A	**Worst Case** N/A	If this risk is realized, change control will be exercised on the System Plan execution to accommodate the realized risk, there is no contribution to T&PRA.
Residual Schedule Impact :	N/A	N/A	N/A	

Risk Assumptions :

1. Funding profile to be used is as follows:
   -$446M in FY16
   -$475M in FY17
   -$490M in FY18
   -$500M in FY19
   -$520M in FY20
   -$525M/yr beginning in FY21 and escalated 1% thereafter, until the end of the Program
- Beginning in FY19, an additional $80M per year in operating funds is available for SWPF operations
- Includes Line Item funding, including assigned contingency, for Saltstone Disposal Units (SDUs) beginning with SDU-7
- Includes Line Item funding, including assigned contingency, for a Glass Waste Storage Project (GWSP)
- The following items are not included in the LW contractor funding and will be funded separately: SWPF (project and operation through end of FY21), Landlord services, Essential Site Services (ESS - Section J and SLAs), DOE Managed, and pension and legacy cost (e.g., Section J and SLAs)
- No “re-pricing” for site services is realized.

Event Comments: This is a Cross-cutting risk owned by DOE. It is a site level risk, and should be reviewed during the FRMP update for ownership by DOE-HQ.

PBS SR-0014

Risk Assessment Form

ID Number: 030 **Revision:** 10 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Event Title: 3H Evaporator Material and Chemical Balance Issues			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 3.0	**Assessable Element Title:** Concentrate Liquid Radioactive Waste		
WBS Number: 01.90.02.01	**WBS Title:** F-H Tank Farm Facilities		
Responsible Org: SRR-ENG	**Contact:** John Contardi	**Date Identified:** 4/24/2006	

Statement of Event: The 3H Evaporator supports DWPF sludge batch preparation, H-Canyon and tank closure. A risk exists that unknown feed components or unexpected constituents are in evaporator feed. This results in a reduction in evaporator performance and subsequent decrease in space recovery versus what is assumed in the baseline.

Likelihood:	Likely	**Basis:** Due to the changing feed sources unexpected constituents are likely and could cause greater salt production or passage of oxalates (e.g. closure activities and new processes).
Consequence / Benefit:	Significant	**Basis:** Based on previous evaporator upset history involving the aluminum-silicate issues in the 2H Evaporator this could impact evaporator availability for up to one year while the issue is being resolved and action taken. Impact would be an inability to perform sludge batch preparation (1 year delay in the worst case). The ability to process strip effluent from SWPF would be impacted for up to one year until sludge batch is available as DWPF feed. Canyon effluents could be restricted also.

Most Significant Cost Impact ($k): 650,000 **Most Significant Schedule Impact :** 1 Yr

Level:	**Moderate**	**Event Trigger:** Currently open; Close upon completion of evaporator activities.
Handling Strategy:	Mitigate	**Description:** Currently an Evaporator Feed Qualification Program is employed to mitigate this event. Transfer Plans include evaporator transfers and are maintained current, change controlled, and approved by facility management. Additionally, the current Program gathers experience gained from previous sludge batch preparations (e.g. risk assessments/mitigation, sludge washing strategy) and incorporates this into planning of the next sludge batch. Any new missions run by H-Canyon would be characterized, evaluated and approved through a formalized WAC process. A realistic salt evaporator model has been developed, however it has not, as yet, been implemented.

Handling Strategy Action Items:

030-1 Implement Aspen Salt Evaporator Model into Evaporator feed planning process., Ryan McNew

HS Implementation Cost ($K):	0	**Basis:** Cost of wash stream sample analysis is within the baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: If processing of material is not feasible, the material causing the problem may be isolated/removed and stored for processing using an alternate handling strategy at a later date. Improved characterization of Evaporator Feed. System Plan Revision 20, base case does not project a need to develop a sludge modifier flowsheet as salt processing and sludge processing complete simultaneously. Previously in System Plan Revision 19 sludge was consumed prior to completion of salt processing which allowed sludge feed breaks to be mitigated by the use of sludge modifier to maintain SWPF production. This rationale is no longer effective as a sludge modifier flowsheet is no longer planned and an impact to sludge processing is a direct impact to Program completion. If at a later date the use of sludge modifier is again forecast as being required, this may be a viable risk handling strategy.

PBS SR-0014 **Risk Assessment Form**

ID Number: 030 **Revision:** 10 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Statement of Residual Risk: After analysis, a potential impactive stream constituent is detected. This allows alternate handling strategy to be developed and implemented before feed is sent to evaporator.

Residual Likelihood:	Unlikely	**Basis:** It is probable that influents containing unexpected constituents may be found that degrade evaporator performance, however the likelihood and consequences of this risk has been reduced for sludge batch preparation.
Residual Consequence:	Significant	**Basis:** Based on previous evaporator upset history involving the aluminum-silicate issues in the 2H Evaporator this could impact evaporator availability for up to one year while the issue is being resolved and action taken. Impact would be an inability to perform sludge batch preparation (1 year delay in the worst case). The ability to process strip effluent from SWPF would be impacted for up to one year until sludge batch is available as DWPF feed. Canyon effluents could be restricted also.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 325,000	**Worst Case** 650,000	Worst Case: 1 year impact to the Program. Most Likely Case: 6 months impact to the program.
Residual Schedule Impact :	1 Mths	6 Mths	1 Yr	Best case: Able to place wash water into tank (temporary use of an old-style tank). Assessed as 1 month.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 325,000	**Worst Case** 650,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	1 Mths	6 Mths	1 Yr	

Risk Assumptions :

32. The 2H Evaporator System is used to evaporate DWPF recycle. The 3H Evaporator is used to process streams that minimize scale production, i.e., canyon wastes and sludge batch decants. The evaporator system feed and concentrate receipt tanks configuration is:

- 3H: Feed – Tank 32; Receipt – Tanks 30 and Tank 37
- 2H: Feed – Tank 43; Receipt – Tank 38.

Event Comments: See also Risk 116. Interface risk with Canyon operations PBS11/12. For Hg issues see Risk 464.

PBS SR-0014

Risk Assessment Form

ID Number: 033 **Revision:** 08 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Heel Removal/Annulus Cleaning Flowsheet Interface Problems			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 6.0	**Assessable Element Title:** Closure (Tanks, Evap. & Ancil. Equip) Including Heel Removal		
WBS Number: 01.90.01	**WBS Title:** Waste Removal and Tank Closure		
Responsible Org: SRR-ENG	**Contact:** John Occhipinti	**Date Identified:** 4/3/2006	

Statement of Event: Heel removal impacts downstream processes e.g. oxalic acid producing oxalates which impact ARP/MCU and/or SWPF and Evaporator operation, large volumes of dilution water can impact tank farm space, higher than anticipated activity can challenge above ground transfer systems and equipment rad hardening, presence of zeolite (fast settling solids) challenges the volume of dilution liquid needed to transfer the zeolite. Flowsheet development with acids must also take into account the undesirable characteristics of zeolite which may form gels (i.e. Tank 24 and 7).

Likelihood:	Unlikely	**Basis:** An unworkable flowsheet due to oxalates (already within waste and also added by cleaning) which cannot be dispositioned is currently a concern during flowsheet development. Zeolite disposition remains a concern.
Consequence / Benefit:	Negligible	**Basis:** Flowsheet changes will be required, resulting in a cost impact to implement process modifications and schedule impact to compensate for slower processing rates. The flowsheet issues are bounded by the impact of zeolite. The worst case would be the formation of a gel during tank cleaning which is difficult to remove and causes downstream processing complications. To recover from this event, tank heel removal will be delayed up to 6 months while a method of removal/transportation and treatment is deployed. Additional costs could be up to $1M for equipment to facilitate removal and downstream treatment. An impact to tank heel removal will not extend the program duration. However the additional cost to resolve the issue will be an impact in the outyears. OA is available to clean sludge tanks, and therefore in the worst case, if used, 18 tanks would be delayed, each by 1 year. Additional costs to maintain tanks past closure date (over the length of the Program this could be cumulatively up to 12 months at $1M per tank per year = $18M).

Most Significant Cost Impact ($k): 18,000 **Most Significant Schedule Impact :** 0

Level:	**Low**	**Event Trigger:** Open on commencement of heel removal/annulus cleaning flowsheet development; Close on completion of processing heel removal/annulus material.
Handling Strategy:	Avoid	**Description:** Currently the Data Input Review Team (DIRT) process will implement team review and incorporation of sample data into WCS as part of normal ongoing activities associated with WCS to support flowsheet development. Heel removal technologies have been developed and are being improved (e.g. additional mixing pumps can enhance mechanical cleaning). Bulk oxalic acid flowsheet to reduce the amount of oxalates produced has been issued but overall compliance with System Plan 20 requires further analysis for oxalate destruction or elimination. This analysis will be performed as part of the tank cleaning preparation. Investigation and development of a flowsheet minimizing oxalate production for each specific tank to undergo OA cleaning is performed as part of the current program. Model downstream impacts from oxalates in the overall HLW flowsheet as part of the planning process.

Handling Strategy Action Items:

HS Implementation Cost ($K):	0	**Basis:** This is included in the current baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: Investigate treatment methods to minimize volume of additional waste produced for downstream processing, recommend method, and develop demonstration project.

PBS SR-0014 **Risk Assessment Form**

ID Number: 033 **Revision:** 08 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: This risk has been avoided.

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

22. Types I, II, and IV tanks (Tanks 1–24):

-Waste Removal and Tank Removal from Service commitments are per the FFA

- Types I, II, and IV tanks (including Tanks 4, 7, 8, 11, and 21 through 24) may be used to optimize output of the Plan.

23. Type III and IIIA (Tanks 25–51):

-While the Type III and IIIA tanks are not included in the FFA, commitment for completion of waste removal (bulk waste and heel) from all tanks is per the STP

-Tanks are not required to be isolated and grouted to meet the STP

Event Comments:

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Risk Assessment Form

ID Number: 034 **Revision:** 10 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: DWPF Impacted by Chemistry/Rheology of Sludge Waste Feed			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste		
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations		
Responsible Org: SRR-ENG	**Contact:** Eric Freed	**Date Identified:** 4/3/2006	
Statement of Event: Chemistry and rheology properties can impact DWPF operations. A risk exists that unexpected chemical or rheological properties of the waste feed stream interfere with the DWPF vitrification process. This event could cause significant challenges to canister production, decrease in canister production or a temporary stoppage of canister production.			

Likelihood:	Very Likely	**Basis:** With 22 years of DWPF canister operations and numerous sludge tanks remaining to be emptied, it is very likely that an anomalous unforeseen chemical (or rheological) sludge waste property may be encountered. For example a decrease in canister production rate was anticipated due to high aluminum in sludge batches and the associated lower melt rate, however, aluminum dissolution was successfully demonstrated on Sludge Batches 5 and 6. Aluminum dissolution is being planned as needed for future sludge batches. Recently, SME coil fouling was encountered due to the rheology of the sludge feed which resulted in having to remove the coil for cleaning, and melter Inconel 690 thermowell intergranular attack resulted in a portion of the thermowell detaching and falling to the floor of the melter. During operations, rheology issues do occur and work arounds, to date, have overcome these with only small production impacts.
Consequence / Benefit:	Marginal	**Basis:** Impacts from unforeseen chemical (or rheological) sludge waste properties could be severe enough to halt sludge batch processing for up to 8 months. Based on previous experience, 4 months would be required to obtain a sample of the sludge batch and perform laboratory testing/analysis. Identification and implementation of corrective actions to allow processing to restart such as acid addition, frit changes or re-batching of the sludge feed could take an additional 4 months. The worst case assumes that a Sludge Batch has this condition and impacts the Program by 8 months which would also force a cessation in SWPF processing. The end date for the Program will be extended. Additional costs will be incurred ($8M) to maintain sludge batch preparation capabilities ($10M/yr).

Most Significant Cost Impact ($k): 441,000	**Most Significant Schedule Impact :** 8 Mths

Level:	**Moderate**	**Event Trigger:** Currently open; Close on completion DWPF operations.
Handling Strategy:	Mitigate	**Description:** As part of ongoing operations, frit formulations are currently subjected to continuous optimization and new frit formulations are being investigated and developed. As part of the current program, process changes at DWPF that will more readily accommodate handling of sludge waste with differing chemistry/rheology are evaluated and recommended and tank sequencing is evaluated to make up sludge batches that minimize rheology issues. Additionally, evaluate and address issues with increased level of sulfate in sludge feed. Implement the process improvement recommendations of the DWPF reliability review team. Investigate areas where more robustness can be added to the processing system (e.g. different types of pumping systems).

Handling Strategy Action Items:

034.1 Implement the process improvement recommendations of the DWPF reliability review team., John Iaukea

034.2 Investigate areas where more robustness can be added to the processing system (e.g. different types of pumping systems)., Pedro Flores

HS Implementation Cost ($K):	0	**Basis:** In the baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: When additional tank space is available, sludge batches could be prepared well in advance of need dates to avoid this impact. System Plan Revision 20, base case does not project a need to develop a sludge modifier flowsheet as salt processing and sludge processing complete simultaneously. Previously in System Plan Revision 19 sludge was consumed prior to completion of salt processing which allowed sludge feed breaks to be mitigated by the use of sludge modifier to maintain SWPF production. This rationale is no longer effective as a sludge modifier flowsheet is no longer planned and an impact to sludge processing is a direct impact to Program completion. If at a later date the use of sludge modifier is again forecast as being required, this may be a viable risk handling strategy.

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Risk Assessment Form

ID Number: 034 **Revision:** 10 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: Even after application of the risk handling strategies and optimization of the process, a risk exists that chemistry/rheology problems require sampling, analysis and re-batching of a sludge batch.

Residual Likelihood:	Likely	**Basis:** After the process improvements are made, and a greater knowledge gained on the chemical and rheological properties of the waste stream, there is a reduction in the likelihood that an impact would be realized.
Residual Consequence:	Marginal	**Basis:** Impacts from unforeseen chemical (or rheological) sludge waste properties could be severe enough to halt sludge batch processing for up to 8 months. Based on previous experience, 4 months would be required to obtain a sample of the sludge batch and perform laboratory testing/analysis. Identification and implementation of corrective actions to allow processing to restart such as acid addition, frit changes or re-batching of the sludge feed could take an additional 4 months. The worst case assumes that a Sludge Batch has this condition and impacts the program by 8 months which would also force a cessation in SWPF processing. The end date for the Program will be extended. Additional costs will be incurred ($10M) to maintain sludge batch preparation capabilities.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 166,000	**Most Likely** 331,000	**Worst Case** 441,000
Residual Schedule Impact :	3 Mths	6 mths	8 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: Rebatching and sampling delaying up to 8 Mths and additional cost of $8M to maintain sludge batch preparation capabilities ($10M/yr).

Most Likely Case: Remediation and sampling delaying up to 6 months and additional cost of $6M to maintain sludge batch preparation capabilities ($10M/yr).

Best Case: Minor remediation and sampling delaying up to 3 months and additional cost of $3M to maintain sludge batch preparation capabilities ($10M/yr).

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 166,000	**Most Likely** 331,000	**Worst Case** 441,000
Residual Schedule Impact :	3 Mths	6 mths	8 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on risk having out-year consequences only.

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 036 **Revision:** 12 **Last Date Evaluated:** 2/10/2016 **Status:** Active

Event Title: Sampling and Analysis of Salt Feed to ARP/MCU Shows SPF WAC Cannot be Met After Processing		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 4.1.1	**Assessable Element Title:** ARP/MCU Salt Processing	
WBS Number: 01.90.03	**WBS Title:** Waste Treatment	
Responsible Org: SRR-ENG	**Contact:** John Contardi	**Date Identified:** 4/3/2006

Statement of Event: Analysis of waste tank samples and process data is used to identify suitable feed sources for ARP/MCU that will result in a waste stream that can be accepted by SPF after processing by those facilities. This includes maintaining the limits imposed to ensure Hazard Categories are met. A risk exists that sampling of feed sources prior to processing by ARP/MCU determines the resulting feed to SPF will not meet the SPF WAC or cannot be processed by MCU while maintaining a Haz. Cat. 3 classification. Processing by ARP/MCU cannot proceed with that feed.

Likelihood:	Unlikely	**Basis:** There is sufficient data (both historic and recent) showing that SPF is capable of handling salt waste planned for disposal at a Saltstone Vault after processing through ARP/MCU and that MCU can maintain Haz. Cat. 3 Classification. Based on experience to date (up to and including Salt Batch 9), it is considered unlikely that a batch may be sampled and found to not meet the WAC (e.g. due to the variability/accuracy of sampling of feed tanks) and will have to be remediated.
Consequence / Benefit:	Negligible	**Basis:** Salt waste will not be suitable for processing or disposal at Saltstone. A schedule delay will be realized to allow waste stream adjustment (blending). 6 months delay to ARP/MCU operations (at 3Mgals/yr capacity-worst case occurring during maximum production) results in an overall delay to program of approx. 2 months (SWPF processing 1.5Mgals not processed as planned by ARP/MCU).

Most Significant Cost Impact ($k): 108,000 **Most Significant Schedule Impact :** 2 Mths

Level:	**Low**	**Event Trigger:** Currently open; Close on completion of ARP/MCU salt processing activities.
Handling Strategy:	Mitigate	**Description:** Sample source tanks prior to salt processing to establish a high confidence level in suitable feed tank selection and preparation. As part of salt batch qualification, perform bench scale tests as early as feasible using real waste samples of intended feed sources to validate decontamination factor assumptions.

Handling Strategy Action Items:

036-1 Evaluate source tank sampling and implement this as an improvement to waste qualification., Ryan McNew

HS Implementation Cost ($K):	0	**Basis:** The cost of evaluation of sampling needs and bench scale testing is within the current baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: None

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Risk Assessment Form

ID Number: 036 **Revision:** 12 **Last Date Evaluated:** 2/10/2016 **Status:** Active

Statement of Residual Risk: Even with source tank sampling and data gathering, the feed can fail to meet requirements when sampled and bench tested immediately before processing. With a successful change in the waste qualification strategy, the risk of encountering a feed problem can be greatly reduced.

Residual Likelihood:	Very Unlikely	**Basis:** With a successful change in the waste qualification strategy, the likelihood of encountering a feed problem can be greatly reduced.
Residual Consequence:	Negligible	**Basis:** Salt waste will not be suitable for processing or disposal at Saltstone. A schedule delay will be realized to allow waste stream adjustment (blending). 6 months delay to ARP/MCU operations (at 3Mgals/yr capacity-worst case occurring during maximum production) results in an overall delay to program of approx. 2 months (SWPF processing 1.5Mgals not processed as planned by ARP/MCU).
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 75,000	**Worst Case** 108,000	Worst Case: 6 mths delay to ARP/MCU processing which results in additional salt to be processed through SWPF (~ 2 Mths impact to Program).
Residual Schedule Impact :	1 Wks	6 Wks	2 Mths	Most Likely Case: 4 Mths delay to ARP/MCU processing which results in additional salt to be processed through SWPF (~6 wks impact to Program). Best Case: Concentration averaging of the feed is allowed. A delay of 1 month in ARP/MCU processing is incurred while paperwork is approved for one -time WAC deviation. This results in approx 1 week delay to Program.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 75,000	**Worst Case** 108,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	1 Wk	6 Wks	2 Mths	

Risk Assumptions :

2. ARP/MCU:

-No major modifications to ARP/MCU will be implemented to increase processing capacity to over 3 million gallons per year. Modifications that may be made including upgrading ARP/MCU facilities as required to maintain the operating rate for the extended life.

-ARP/MCU facilities operate to ensure the total Interim Salt Treatment curies emplaced in SPF are within the amount identified in Savannah River Site – Liquid Waste Disposition Processing Strategy (SRS LW Strategy), as amended by letter from the South Carolina Department of Health and Environmental Control (SCDHEC) to DOE-SR and the Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site.

-A seven-month outage in FY17 is planned, coincident with a DWPF melter change-out. This outage will allow for ARP/MCU facility upgrades, which may include contactor bearings, weir adjustment, etc.

-Nominally ARP/MCU will produce:

- For each gallon processed, ~1.2 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 037 **Revision:** 11 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: DWPF Impacted by Chemistry / Quantity of Salt Waste Feed			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-ENG	**Contact:** Eric Freed	**Date Identified:** 4/3/2006	
Statement of Event: A risk exists that chemical properties or increased volume of the feed stream to DWPF (attributed to SWPF) create previously unidentified processing problems impacting canister production (e.g. increase in offgas particulates). This event could cause a significant decrease or a temporary stoppage of canister production at DWPF.			

Likelihood:	Unlikely	**Basis:** With 23 years of DWPF canister operations, and numerous salt tanks remaining to be emptied, it is unlikely that an unforeseen chemistry issue may be encountered during the startup of SWPF (Cs and actinide streams) when an increased volume of waste will be processed. However, experience has been obtained from ARP/MCU operations and bench scale testing of SWPF has been performed. Strip effluent from SWPF while it is operating at a throughput of up to 9 Mgal/yr will be processed by DWPF along with MST solids/sludge. Process improvements at DWPF (Dry frit system, strip effluent to SME, alternate reductant etc.,) achieve the ability to produce 264 canisters per year while processing the strip effluent and MST sludge solids from SWPF when running at full capacity.
Consequence / Benefit:	Significant	**Basis:** These risks could add 12 months to DWPF production due to a reduction of up to 10% in throughput (for the ten years SWPF will operate at maximum capacity) which results in a concurrent reduction in SWPF throughput, (10% would add approximately 1 yr to the Program).
Most Significant Cost Impact ($k): 650,000		**Most Significant Schedule Impact :** 1 Yr
Level:	**Moderate**	**Event Trigger:** Currently open; Close on completion of salt processing activities.
Handling Strategy:	Mitigate	**Description:** Bi-monthly meetings are being held between EPC contractor and LWO to exchange lessons learned and technical data. The meetings have been adopted as part of the normal operational process. The intent of this close exchange is to identify as early as possible any indications that planning assumptions and bases changes have occurred (volume may increase/chemistry may change). Given sufficient upfront indication, a path forward could be developed to avoid impact to DWPF (e.g. design further modifications, evaporator unit operation etc.) SWPF startup will be incrementally ramped up which will allow adjustment of processing parameters and identification of potential problems. Perform COREsim modelling to further investigate impact of increased volumes of waste stream from SWPF. This will be performed as part of System Planning e.g. alternative cases etc., and also upon any indication of planning assumptions and bases changes.
Handling Strategy Action Items:		
HS Implementation Cost ($K):	0	**Basis:** Within the current cost baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.
Other Handling Strategies: Develop and test alternate CPC strategies. Investigate and develop sampling techniques to allow better characterization of the salt waste within a tank.		

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Risk Assessment Form

ID Number: 037 **Revision:** 11 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: A risk remains that chemical properties in conjunction with the increased volume of the feed stream to DWPF create previously unidentified processing problems impacting canister production.

Residual Likelihood:	Unlikely	**Basis:** The likelihood of having additional volume/chemistry issues remains the same.
Residual Consequence:	Negligible	**Basis:** The schedule impact of having additional volume/chemistry issues is avoided by early identification. The additional cost of modification to avoid the impacts to processing (e.g. adding an evaporator or other unit operation) could be up to $20M in the worst case.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 5,000	**Most Likely** 10,000	**Worst Case** 20,000	Worst Case: Additional $20M cost of modification prior to SWPF startup. Most Likely Case: Additional $10M cost of modification prior to SWPF startup. Best Case: Additional $5M cost of modification prior to SWPF startup.
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 5,000	**Most Likely** 10,000	**Worst Case** 20,000	Impact based on near-term consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

4. SWPF nominal capacity is:

-4.625 Mgal/yr for the first year of operation

-7.2 Mgal/yr for the next two years of operation

-An SWPF outage is assumed at an appropriate time afetr the SWPF first year of operation to perform next generation solvent implementation to increase facility capacity to 9.0 Mgal/yr

-Nominally SWPF will produce:

- For each gallon processed, ~1.28 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Note: When production exceeds 7.2Mgal/yr, SE will be limited to 576 kgal/yr

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 040 **Revision:** 09 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Salt Dissolution Results in Greater than Planned Precipitation of Gibbsite		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 4/3/2006

Statement of Event: Saltcake solids consist primarily of sodium salts including nitrate, sulfate, phosphate, aluminate, and oxalate. The baseline dissolution process uses flushwater (FW) or inhibited water (IW) to dissolve the saltcake. As the dissolution progresses to the bottom of the tank, the soluble salts, primarily sodium hydroxide, become progressively less concentrated, resulting in a thermodynamic solubility shift from sodium aluminate to gibbsite, i.e., gibbsite precipitates. The precipitated gibbsite accumulates as a heel in the dissolution tank or deposit in the dissolved salt receiving tank. This material will enter the feed stream to SWPF and ARP/MCU and result in being transferred to DWPF as solids in the MST slurry. Precipitated gibbsite in the heel will be transferred to DWPF as part of a sludge batch. A risk exists that the precipitation of gibbsite is greater than assumed and impacts processing.

Likelihood:	Very Likely	**Basis:** Literature, test data, and field observation support the probability of gibbsite precipitation.
Consequence / Benefit:	Negligible	**Basis:** The precipitated gibbsite is filtered in the SWPF and ARP/MCU processes and sent to DWPF where it is blended with the received sludge batch feed. The heels will be combined with a sludge batch and transferred to DWPF (as part of the sludge batch). The high Al will impact DWPF by creating additional cans and extending the program life cycle. (Assume an additional 60 canisters at an additional cost per canister of transportation and permanent storage costs will be incurred by DOE). This impact will occur at the end of the program where DWPF throughput is low. There will be no extension to the Program, however there will be the cost for 60 additional canisters ($30Kx60).
Most Significant Cost Impact ($k): 1,800		**Most Significant Schedule Impact :** 0
Level:	**Low**	**Event Trigger:** Open on start of salt dissolution; Close on completion of SWPF processing activities.
Handling Strategy:	Mitigate	**Description:** Methods to avoid the precipitation of gibbsite, as well as other aluminum salts, and their impacts to SWPF feed flow sheets have been evaluated. Due to the strategy and cost that would be required to remove gibbsite verses normal salt dissolution, it was determined that inclusion in flow sheets was not warranted at this time. Alternatively, the sludge batches can be blended to account for the additional aluminum content from SWPF and ARP/MCU. Investigate the use of aluminum dissolution for the removal of gibbsite. Currently, as part of the ARP/MCU program, the use of caustic addition is being evaluated for use on a batch by batch basis.
Handling Strategy Action Items:		
HS Implementation Cost ($K):	0	**Basis:** Costs are within the current baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.
Other Handling Strategies: Perform improved studies to generate improved solubility data.		

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Risk Assessment Form

ID Number: 040 **Revision:** 09 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: The precipitated gibbsite, blended with the sludge batch feed to DWPF, may still create additional canisters.

Residual Likelihood:	Likely	**Basis:** The likelihood has been reduced by blending of sludge batches and employing methods to reduce the precipitation.
Residual Consequence:	Negligible	**Basis:** The precipitated gibbsite is filtered in the SWPF and ARP/MCU. Processes and sent to DWPF where it is blended with the received sludge batch feed. The heels will be combined with a sludge batch and transferred to DWPF (as part of the sludge batch). The high Al will impact DWPF by creating additional cans and extending the program life cycle. (Assume an additional 60 canisters at an additional cost per canister of transportation and permanent storage costs will be incurred by DOE).
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	N/A
	0	0	0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Worst Case: Cost of up to 60 additional cans. ($30Kx60)
	600	1,200	1,800	Most Likely Case: Cost of up to 40 additional cans. ($30Kx40)
Residual Schedule Impact :	0	0	0	Best Case: Cost of up to 20 additional cans. ($30Kx20)

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Residual impact based on risk having out-year consequences only.
	600	1,200	1,800	
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments: This is an external interface risk between PBS-SR-0014 and DOE Office(s) responsible for the Federal Repository Project. (additional canisters will be produced).

PBS SR-0014 **Risk Assessment Form**

ID Number: 041 **Revision:** 11 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Formation of Sodium Aluminosilicate in a Salt Tank			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-ENG	**Contact:** Richard Edwards	**Date Identified:** 4/3/2006	
Statement of Event: Saltcake/salt solutions can contain high amounts of silicon or high amounts of aluminum. High silicon and high Al waste streams are mixed as part of the salt processing strategy. A risk exists that mixing high silicon and high aluminum waste results in formation of sodium aluminosilicate (NAS) which would impede further processing if not allowed to settle to the bottom of the tank.			
Likelihood:	Likely	**Basis:** Past experience has shown that the NAS when precipitated will drop to the tank bottom, given sufficient time. NAS becomes part of the insoluble materials in the heel as the salt in the tank is dissolved. Heel removal is part of the LWO System Plan and is funded and scheduled. It is considered unlikely that the time needed to allow for this settling will not be available during future salt processing. Based on recent ISDP operational runs, NAS precipitation in the ARP/MCU Feed Tank has been avoided by caustic addition. The current salt feed preparation process is to perform blending and adjustment planning ahead of salt dissolution based on information available, however, it is likely that this problem will arise due to the uncertainty in this information.		
Consequence / Benefit:	Significant	**Basis:** The precipitation of NAS in Tank 49 could affect processing from Tank 49 (such as downstream processing, criticality concerns, etc.). This is a risk that could adversely affect the salt processing strategy (up to 1 year cumulative delay due to multiple occurrences).	
Most Significant Cost Impact ($k): 650,000		**Most Significant Schedule Impact :** 1 Yr	
Level:	**Moderate**	**Event Trigger:** Currently Open; Close on completion of SWPF processing.	
Handling Strategy:	Mitigate	**Description:** As part of ongoing feed qualification, flowsheets are developed and thermodynamic modeling (e.g. OLI) for salt batching performed with the goal of predicting and precluding solids formation potential and specifically allowing NAS to settle without impacting the feed preparation. Continue to monitor filter performance degradation (512-S) and coalescer performance degradation (MCU) to assess mitigation strategy effectiveness.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** Within current cost baseline	
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.	
Other Handling Strategies: The use of an NAS inhibitor could also help reduce the formation of NAS within the tank. Perform studies to generate improved solubility data.			

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Risk Assessment Form

ID Number: 041 **Revision:** 11 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: NAS may still form during salt dissolution and will slow down feed preparation.

Residual Likelihood:	Unlikely	**Basis:** The likelihood is reduced due to implementation of new flowsheets that target resolutions to NAS formations.
Residual Consequence:	Marginal	**Basis:** The formation of NAS slows down the salt dissolution process and impacts the overall program by 6 Mths.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	0	0	0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	0	163,000	325,000
Residual Schedule Impact :	0	3 Mths	6 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: The formation of NAS slows down the ability to process salt solution and impacts the overall program by 6 mths.

Most Likely Case: The formation of NAS slows down the ability to process salt solution and impacts the overall program by 3 Mths.

Best Case: NAS is formed, but it remains in the heel.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	0	163,000	325,000
Residual Schedule Impact :	0	3 Mths	6 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on risk having out-year consequences only.

Risk Assumptions :

2. ARP/MCU:

-No major modifications to ARP/MCU will be implemented to increase processing capacity to over 3 million gallons per year. Modifications that may be made including upgrading ARP/MCU facilities as required to maintain the operating rate for the extended life.

-ARP/MCU facilities operate to ensure the total Interim Salt Treatment curies emplaced in SPF are within the amount identified in Savannah River Site – Liquid Waste Disposition Processing Strategy (SRS LW Strategy), as amended by letter from the South Carolina Department of Health and Environmental Control (SCDHEC) to DOE-SR and the Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site.

-A seven-month outage in FY17 is planned, coincident with a DWPF melter change-out. This outage will allow for ARP/MCU facility upgrades, which may include contactor bearings, weir adjustment, etc.

-Nominally ARP/MCU will produce:

- For each gallon processed, ~1.2 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 042 **Revision:** 10 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Salt Waste Heel or Tank Annuli Waste has to be Processed Through DWPF		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: SRR-ENG	**Contact:** Ryan McNew	**Date Identified:** 4/3/2006

Statement of Event: Heel material and smaller volumes of annulus material is planned to be processed by SWPF up until the WAC limit of SWPF is approached. After this point, the System Plan accommodates the processing of solids by allowing for settlement of residual material and inclusion into a sludge batch for processing at DWPF. A risk exists that the amount of residual material is greater/different than planned, forcing DWPF to receive more waste and/or with a different waste characterization than anticipated for processing.

Likelihood:	Likely	**Basis:** Salt removal is performed on a tank by adding water to dissolve the salt. It is expected that the most soluble components will go into solution first. After performing several salt dissolution campaigns, there is the potential that the remaining salt heel will not dissolve easily and may require some alternative process to remove. The resultant salt heel solution stream may exceed SWPF WAC limits for some component. Depending on the annulus condition, the same issue may exist for salt removed from a tank annulus.
Consequence / Benefit:	Marginal	**Basis:** If heel/annuli material cannot be processed by SWPF, it will be processed by DWPF. This would be a negligible impact to the Program; however, the worst case would be that the material would require a processing/blending strategy and would add volume to DWPF processing. Based on subject matter expert consensus, the impact of additional volume of material could be no more than 6 months additional processing by DWPF.

Most Significant Cost Impact ($k): 325,000 **Most Significant Schedule Impact :** 6 Mths

Level:	**Moderate**	**Event Trigger:** Open on start of salt heel removal processing; Close on completion of SWPF processing activities.
Handling Strategy:	Mitigate	**Description:** Currently, early salt dissolution campaigns will be closely monitored for rates and effectiveness. Develop a plan (system plan/sludge/salt processing plan), based on data obtained, to allow processing by SWPF/DWPF of salt from tank heel or annulus by introduction of a revised plan which will disposition during salt/sludge batch preparation.

Handling Strategy Action Items:

042.2 Develop a plan (system plan/sludge/salt processing plan), based on data obtained, to allow processing by SWPF/DWPF of salt from tank heel., Pete Hill

HS Implementation Cost ($K):	0	**Basis:** Monitoring of dissolution and flowsheet development is included in the baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: None

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Risk Assessment Form

ID Number: 042 **Revision:** 10 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: Resultant streams could still impact planned processing through SWPF hence requiring additional material to be processed through DWPF.

Residual Likelihood:	Very Unlikely	**Basis:** Mitigation strategy does reduce the likelihood of the event occurring by development of (system plan/sludge/salt processing plan) based on data.
Residual Consequence:	Marginal	**Basis:** Mitigation strategies are completed with little effect, resulting in a delay to the program of 6 Mths.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 81,000	**Most Likely** 163,000	**Worst Case** 325,000
Residual Schedule Impact :	1.5 Mths	3 Mths	6 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: Mitigation strategies are completed with little effect, resulting in a delay to the program of 6 Mths.

Most Likely Case: Information obtained from monitoring and sampling is used for future tanks to minimize impact to the program. Impact would be reduced to 3 Mths

Best Case: Mitigation strategies are completed with some effect, resulting in a delay to the program of 1.5 Mths.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 81,000	**Most Likely** 163,000	**Worst Case** 325,000
Residual Schedule Impact :	1.5 Mths	3 Mths	6 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on risk having out-year consequences only.

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 045 **Revision:** 10 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Higher Curie Sludge Impacts DWPF Canister Production		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 4.2	**Assessable Element Title:** Sludge Processing	
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations	
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 4/3/2006

Statement of Event: Sludge from tanks (e.g. 32, 35 and 39) with significantly higher curie content (inhalation dose, hydrogen generation rate), will be processed through DWPF. The processing plan assumes this higher curie sludge can be processed at normal throughput. A risk exists that the rate of processing at DWPF is impacted by handling this higher curie sludge due to safety basis requirements.

Likelihood:	Likely	**Basis:** Tanks 32, 35, and 39 were not included in the development of the DWPF sludge source term because they were receiving fresh waste and their sludge composition was expected to differ significantly from the earlier separations operations. It is uncertain if the sludge from these tanks (when blended) would be within the current source term when processed at DWPF.
Consequence / Benefit:	Significant	**Basis:** Processing the sludge from these tanks (along with future receipts from H canyon) will result in being unable to process sludge as quickly as planned. The end date for sludge processing will be extended up to 1 year. This impact would extend the Program up to 1 Year.

Most Significant Cost Impact ($k): 650,000 **Most Significant Schedule Impact :** 1 Yr

Level:	**Moderate**	**Event Trigger:** Open on start of high curie sludge processing; Close on completion of Tank 32, 35 and 39 sludge processing activities.
Handling Strategy:	Mitigate	**Description:** Currently a Sludge Batch Qualification Program is implemented for each sludge batch during which the sludge is qualified for processing through DWPF. Continuing integration efforts with H-Canyon are proceeding to assist in evaluating future missions' impacts on sludge contents in H-Tank Farm. Also considering sludge curie / wattage issues when planning future sludge batches. Ensure Tanks 32, 35 and 39 are sequenced as early as feasible to reduce any potential impacts. Additionally perform sampling and analysis of the sludge contents of Tanks 32, 35 and 39. Develop a blending strategy to avoid any impact of higher curie sludge to processing and incorporate into processing plan. Revise AB as necessary, taking advantage of benefits from alternate reductant deployment, to reflect processing of these tanks.

Handling Strategy Action Items:

045.6 Perform sludge batch sampling (slurry sample) and analysis for Tanks 32, 35, and 39 prior to transfer out and revise DSA if required., Richard Edwards

HS Implementation Cost ($K):	0	**Basis:** Cost is within the current baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: System Plan Revision 20, base case does not project a need to develop a sludge modifier flowsheet as salt processing and sludge processing complete simultaneously. Previously in System Plan Revision 19 sludge was consumed prior to completion of salt processing which allowed sludge feed breaks to be mitigated by the use of sludge modifier to maintain SWPF production. This rationale is no longer effective as a sludge modifier flowsheet is no longer planned and an impact to sludge processing is a direct impact to Program completion. If at a later date the use of sludge modifier is again forecast as being required, this may be a viable risk handling strategy.

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Risk Assessment Form

ID Number: 045 **Revision:** 10 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: A risk remains that the rate of processing at DWPF is impacted by handling this higher curie sludge due to safety basis requirements.

Residual Likelihood:	Likely	**Basis:** Tanks 32, 35, and 39 were not included in the development of the DWPF sludge source term because they were receiving fresh waste and their sludge composition was expected to differ significantly from the earlier separations operations. It is uncertain if the sludge from these tanks (when blended) would be within the current source term when processed at DWPF.
Residual Consequence:	Marginal	**Basis:** Resequencing tanks and earlier sampling of contents will reduce the impact. Worst case impact is estimated to be a 6 month delay.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 250	**Most Likely** 163,000	**Worst Case** 325,000
Residual Schedule Impact :	0	3 Mths	6 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: 6 Mths impact to the Program to evaluate and utilize alternatives (e.g. DSA changes, batch plan changes).

Most Likely Case: 3 Mths impact to the Program to evaluate and utilize alternatives (e.g. DSA changes, batch plan changes).

Best Case: DSA change/ minor batch plan change is required at a cost of $250K.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 250	**Most Likely** 163,000	**Worst Case** 325,000
Residual Schedule Impact :	0	3 Mths	6 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Impacts based on outyear consequences only.

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

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Risk Assessment Form

ID Number: 048 **Revision:** 11 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Sludge Physical Properties Cause Delays in Meeting Sludge Feed Objectives		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 4.0	**Assessable Element Title:** Process Radioactive Waste	
WBS Number: 01.90.03	**WBS Title:** Waste Treatment	
Responsible Org: SRR-ENG	**Contact:** Richard Edwards	**Date Identified:** 4/3/2006

Statement of Event: Waste Removal evaluations are performed with waste removal systems that are designed to meet functional performance requirements (FPRs). These FPRs are directly affected by physical properties (rheology) such as specific gravity, hardness, solubility, settling characteristics, particle size, cohesiveness, shear strength, etc. A risk exists that prior to and/or during waste removal evolutions, it is determined that physical properties do not meet expected values and as a result there are delays in meeting waste removal objectives (redesign of equipment) or a change in operating strategy (chemical/ rheological differences e.g. processing, settling etc.).

Likelihood:	Likely	**Basis:** WCS identifies the radiological and chemical characteristics of sludge in each liquid waste tank. Placement and management of waste in liquid waste tanks can create changes to the physical properties (as defined by other sources of data) of the waste due to temperature, pressure, pH, washing of the material, and chemical reactions. However, significant experience with designing waste removal systems to complete waste removal activities has shown these issues are unlikely. There is also a possibility that the removal process itself may change the physical properties of the sludge during removal. Based on the number of tanks that will undergo waste removal, this is considered a likely event.
Consequence / Benefit:	Marginal	**Basis:** These changes in physical properties can cause delays in meeting sludge feed objectives due to the fact that waste removal systems or sludge feed preparation process can not compensate for the changes. The process will be halted while investigations into material physical properties are performed and the process adjusted and a path forward created. (A delay of 6 months to develop a path forward and implement). After implementing path forward, additional heel volume is left for heel removal; however, this would not impact heel removal activities). The end date for salt processing will be extended if a DWPF feed break is realized which will also extend the end of the Program.

Most Significant Cost Impact ($k): 325,000	**Most Significant Schedule Impact :** 6 Mths

Level:	**Moderate**	**Event Trigger:** Currently open; Close on completion of WR activities.
Handling Strategy:	Mitigate	**Description:** The current program cannot feasibly sample all tanks comprehensively to establish a high confidence in physical properties of the material being removed. Each operations activity will identify the methodology to be used to handle this risk (e.g. splitting batches, SOL, Al dissolution, adjustment of wt%, etc.,). Additionally new technologies for waste removal are being investigated as part of the ongoing program. Current sludge batch planning program utilizes WCS data to evaluate processsability and minimise issues.

Handling Strategy Action Items:

048.2 Evaluate sludge batch planning program to potentially predict processsability., Richard Edwards

HS Implementation Cost ($K):	0	**Basis:** It is assumed that some of the tanks will require sampling or other data collection will be required and these costs as well as the review of WCS data will be included in the baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: Perform investigation across DOE and develop an RFP for new methods of obtaining rapid, high quality tank farm characterization data.

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Risk Assessment Form

ID Number: 048 **Revision:** 11 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: Even after each project/operations activity has developed and implemented a tailored methodology for waste removal and where possible is utilizing the latest technology, a risk exists that removal can be impacted by the physical properties of the material and the sludge may not meet feed objectives.

Residual Likelihood:	Very Unlikely	**Basis:** With applying handling strategies and with waste removal objectives allowing residual waste to remain in the tank for heel removal it is very unlikely sludge cannot be removed sufficiently during BWR to meet the goal of leaving less than 10,000 gallons for heel removal.
Residual Consequence:	Marginal	**Basis:** Sludge feed objectives can not be met due to waste physical properties, delaying sludge batch preparation. 3 mths delay to sludge processing impacting the end date of the Program by 3 Mths.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 108,000	**Worst Case** 163,000
Residual Schedule Impact :	1 Mth	2 Mths	3 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: Sludge feed objectives can not be met due to waste physical properties. Delay to sludge batch preparation. 3 mths delay to sludge processing impacting the end date of the Program by 3 Mths.

Most Likely Case: Sludge feed objectives can not be met due to waste physical properties. Delay to sludge batch preparation. 2 mths delay to sludge processing impacting the end date of the Program by 2 Mths.

Best Case: Sludge feed objectives can not be met due to waste physical properties. Delay to sludge batch preparation. 1 mth delay to sludge processing impacting the end date of the Program by 1 Mth.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 108,000	**Worst Case** 163,000
Residual Schedule Impact :	1 Mth	2 Mths	3 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on risk having out-year consequences only.

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 070 **Revision:** 09 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Rogue Constituents in Salt Feed			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-ENG	**Contact:** John Contardi	**Date Identified:** 4/3/2006	
Statement of Event: The solvent extraction and actinide removal processes in SWPF and ARP/MCU are assumed to be successful given the expected waste constituents. A risk exists that unknown and unexpected constituents affect these processes (either by adversely impacting processing or resulting in a stream that cannot meet a WAC of the downstream facility[s]) and their throughput is adversely impacted.			
Likelihood:	Likely	**Basis:** To date, the presence of rogue constituents (if any) has not impacted ARP/MCU processing. Not all tanks have been fully characterized (particularly saltcake) and it is likely that other past influents may introduce unanticipated constituents that were not present during the real waste tests.	
Consequence / Benefit:	Significant	**Basis:** Multiple tanks are planned for preparation of salt solution feed. The worst case impact is estimated at 1 year cumulative program delay with multiple occurrences requiring isolation of the batch and remediation.	
Most Significant Cost Impact ($k): 650,000		**Most Significant Schedule Impact :** 1 Yr	
Level:	**Moderate**	**Event Trigger:** Currently open; Close on completion of salt processing.	
Handling Strategy:	Mitigate	**Description:** As part of the current program, significant differences between future tanks and tanks tested to date are identified. As part of the salt feed qualification, bench scale tests on real waste will determine if impacts to processing will be realized. Additional risk handling strategies: Obtain processing data from ARP/MCU operation to be used in process planning for SWPF; Perform real waste testing for SWPF if ARP/MCU results indicate the potential for a problem. Evaluate the need to perform real waste sampling/testing on source tanks to prevent encountering issues during batch qualification. A window has been provided in salt batch preparation planning for transfers, sampling, analysis and qualification.	
Handling Strategy Action Items: 070.4 If ARP/MCU real waste testing during batch qualification or operations indicates the potential for a problem with rogue constituents, perform real waste testing for SWPF batches., Keith Harp 070.5 Evaluate the need for real waste testing for SWPF feed., Dave Sherburne			
HS Implementation Cost ($K):	0	**Basis:** Within current cost baseline.	
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 070 **Revision:** 09 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: Tank waste characterization will be based on limited sampling and may not reflect complete inventory of tank. This risk may still be realized.

Residual Likelihood:	Unlikely	**Basis:** Likelihood is greatly reduced by performing real waste tests, ARP/MCU operation, and incorporation of this data into SWPF feed qualification program.
Residual Consequence:	Marginal	**Basis:** Rogue elements are found that impact SWPF processing, but their concentration (based on not being detected during characterization) is small, however there is an impact to SWPF Processing which is further limited by the SWPF process robustness. The worst case impact is estimated at 3 months cumulative program delay with occurrences requiring isolation of the batch and remediation.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	0	0	0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	0	108,000	163,000
Residual Schedule Impact :	0	2 Mths	3 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: Rogue elements are found that impact SWPF processing, but their concentration (based on not being detected during characterization) is small, however there is an impact to SWPF Processing which is further limited by the SWPF process robustness.

Most Likely Case: Impact is realized, but is limited to two months impact to the Program.

Best Case: Rogue constituents exist, but do not impact SWPF processing.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	0	108,000	163,000
Residual Schedule Impact :	0	2 Mths	3 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on risk having out-year consequences only.

Risk Assumptions :

2. ARP/MCU:

-No major modifications to ARP/MCU will be implemented to increase processing capacity to over 3 million gallons per year. Modifications that may be made including upgrading ARP/MCU facilities as required to maintain the operating rate for the extended life.

-ARP/MCU facilities operate to ensure the total Interim Salt Treatment curies emplaced in SPF are within the amount identified in Savannah River Site – Liquid Waste Disposition Processing Strategy (SRS LW Strategy), as amended by letter from the South Carolina Department of Health and Environmental Control (SCDHEC) to DOE-SR and the Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site.

-A seven-month outage in FY17 is planned, coincident with a DWPF melter change-out. This outage will allow for ARP/MCU facility upgrades, which may include contactor bearings, weir adjustment, etc.

-Nominally ARP/MCU will produce:

- For each gallon processed, ~1.2 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

4. SWPF nominal capacity is:

-4.625 Mgal/yr for the first year of operation

-7.2 Mgal/yr for the next two years of operation

-An SWPF outage is assumed at an appropriate time afetr the SWPF first year of operation to perform next generation solvent implementation to increase facility capacity to 9.0 Mgal/yr

-Nominally SWPF will produce:

- For each gallon processed, ~1.28 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Note: When production exceeds 7.2Mgal/yr, SE will be limited to 576 kgal/yr

Event Comments: Cross-cutting risk with the DOE-SR SWPF Project during the first year of operations.

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Risk Assessment Form

ID Number: 083 **Revision:** 10 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Non-routine Constituents in Sludge Impact Canister Production Rate		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 4.2	**Assessable Element Title:** Sludge Processing	
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations	
Responsible Org: SRR-ENG	**Contact:** Eric Freed	**Date Identified:** 4/3/2006

Statement of Event: The existence of non-routine constituents in sludge (e.g., rhodium, heavy metals, oxalates, coal, burkeite, zeolite, etc.) is a known fact based on processing records. However, what is not well understood is the impact of these constituents on canister production rate. Also, because of large movements of sludge between tanks over the years, the amount of some of these components in specific tanks is indeterminate. In addition, it is expected that additional unknown constituents will be found in sludge that will impact processability.

Likelihood:	Very Likely	**Basis:** Based on sludge processed to date and upon historical records, non-routine waste exists in several of the sludge tanks.
Consequence / Benefit:	Severe (Critical)	**Basis:** Impacts from non-routine constituents in a sludge batch e.g. rhodium, heavy metals, oxalates, coal, burkeite, zeolite, etc., could be severe enough to halt sludge batch processing while sludge is rebatched. Based on previous experience, 4 months would be required to obtain a sample of the sludge batch and perform laboratory testing/analysis. Identification and implementation of corrective actions to allow processing to restart such as acid addition, frit changes or re-batching of the sludge feed could take an additional 8 months. The worst case assumes that this could occur twice during the sludge processing mission. Each occurrence impacting the program by 1 year to give a total worst case of up to 2 years loss of DWPF production. This directly impacts SWPF and results in a 2 year overall impact to the Program. Additional costs will be incurred ($10M/year) to maintain sludge batch preparation capabilities.

Most Significant Cost Impact ($k): 1,320,000 **Most Significant Schedule Impact :** 2 Yrs

Level:	**High**	**Event Trigger:** Currently open; Close on completion of DWPF sludge processing.
Handling Strategy:	Mitigate	**Description:** As part of the normal planning evolution, lessons learned are reviewed and incorporated into each revision of the Sludge Batch Plan. These lessons learned are from previous sludge removal, preparation and processing campaigns and in the execution of sludge batch preparation. Sludge batch preparation includes sampling and qualification. The processability recommendations from the 2013 DWPF reliability review team will be incorporated into DWPF operations.

Handling Strategy Action Items:

083.1 Incorporate the processability recommendations from the 2013 DWPF reliability review team into DWPF operations., John laukea

HS Implementation Cost ($K):	0	**Basis:** This is within the cost baseline
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: When additional tank space is available, sludge batches could be prepared well in advance of need dates to avoid this impact. System Plan Revision 20, base case does not project a need to develop a sludge modifier flowsheet as salt processing and sludge processing complete simultaneously. Previously in System Plan Revision 19 sludge was consumed prior to completion of salt processing which allowed sludge feed breaks to be mitigated by the use of sludge modifier to maintain SWPF production. This rationale is no longer effective as a sludge modifier flowsheet is no longer planned and an impact to sludge processing is a direct impact to Program completion. If at a later date the use of sludge modifier is again forecast as being required, this may be a viable risk handling strategy.

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Risk Assessment Form

ID Number: 083 **Revision:** 10 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: A risk remains that non-routine constituents may still be encountered during sludge batch preparation, but not during processing.

Residual Likelihood:	Likely	**Basis:** Mitigation strategies reduce the likelihood of encountering unidentified non-routine constituents.
Residual Consequence:	Significant	**Basis:** A non-routine constituent is found during sludge batch qualification which disqualifies the sludge batch. Assuming for the worst case one month before DWPF need date and the sludge batch cannot be remediated so a new sludge batch must be prepared. This could take up to 18 months. The delay to sludge processing would be 17 months (18 mths -1mth). Additional cost for sludge batch preparation of up to $10M.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 82,250	**Most Likely** 165,500	**Worst Case** 931,000	Worst Case: A complete new sludge batch is required. Up to 17 Mths delay and $10M Most Likely Case: A sludge processing extension of 3 Months and additional cost of $2.5M to remediate the existing sludge batch. Best Case: A sludge processing extension of 1.5 Months and additional cost of $1.25M to remediate the sludge batch.
Residual Schedule Impact :	1.5 Mths	3 Mths	17 Mths	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 82,250	**Most Likely** 165,500	**Worst Case** 931,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	1.5 Mths	3 Mths	17 Mths	

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

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Risk Assessment Form

ID Number: 084 **Revision:** 11 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Lack of Dispositioning of Failed Equipment Impacts DWPF Operations		
Type: Risk, Internal, Technical	**Category:** Resources/Conditions	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 4/3/2006

Statement of Event: Failed canyon equipment is stored on cell covers as a temporary measure until a disposition path is found. The lack of disposition path options results in build-up of equipment inventory in temporary storage. Operations within the DWPF canyon require periodic movement of this equipment to gain access to cells. A risk exists that these additional evolutions directly impact DWPF operations.

Likelihood:	Very Likely	**Basis:** DWPF presently has a significant inventory of failed equipment stored on cell covers from 20 years of radioactive operation. Remote evolutions within the canyon require moving the failed equipment to gain access to the process equipment below the cell covers. This is anticipated to get worse over the remaining years of DWPF operation. Recent improvements in melter process attainment and throughput have been achieved by the addition of new remote equipment with limited life expectancies such as the glass pump and the heated bellows liner. Implementation of the melter bubblers (4 total) replaced the glass pump and will further increase the quantity of spent equipment stored in the DWPF canyon awaiting final disposition. Note: This does not include disposal of a failed melter.
Consequence / Benefit:	Negligible	**Basis:** The consequence of not being able to support DWPF canyon operations due to the inability to disposition failed equipment is not considered a credible worst case as disposition paths have been established, however, the interruption to production if encountered during a year when peak production is required of DWPF may not be easily compensated for with sprint capacity. This worst case could result in an impact of no greater 2 months canister production downtime over the life of the facility.

Most Significant Cost Impact ($k): 108,000	**Most Significant Schedule Impact :** 2 Mths

Level:	**Low**	**Event Trigger:** Currently open; Close on completion of DWPF processing.
Handling Strategy:	Mitigate	**Description:** 1) Review lessons learned from SME / Melter Replacement Outage; 2) Identify equipment to dispose as LLW; 3) Identify equipment to dispose as HLW; 4) Evaluate disposal options (cut up with shear / existing storage boxes / new storage boxes). Use of bubblers (and partial replacement), providing additional storage facilities and cutting up discarded jumpers (as far as practical) is underway. BROKK unit has been procured but has not been deployed. Limited temporary shielded storage has been provided.

Handling Strategy Action Items:

084.2 Develop strategy for dispositioning failed large equipment identified as HLW. (e.g. size reduction for disposal with melter in FESV/removal of Melter 1 from FESV to provide additional space etc.) and additional FESVs as required., George Matis

084.4 Implement recommendations of plan for removal and storage of failed equipment., George Matis

HS Implementation Cost ($K):	0	**Basis:** Within current baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: FESVs are in the cost baseline but only as required for melters, additional FESVs (assume 2 for the life cycle @ $3M each) and miscellaneous storage boxes (assume $2M) would be required for other failed equipment e.g. melter bellows, failed processing vessels, jumpers etc. Design and deploy shielded boxes as needed for storage of failed equipment.

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Risk Assessment Form

ID Number: 084 **Revision:** 11 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: A risk remains that these additional evolutions directly impact DWPF operations.

Residual Likelihood:	Likely	**Basis:** Likelihood of impacts has been reduced by size reduction and performing LLW disposition.
Residual Consequence:	Negligible	**Basis:** The consequence of not being able to support DWPF canyon operations due to the inability to disposition failed equipment is not considered a credible worst case as disposition paths have been established, however, the interruption to production if encountered during a year when peak production is required of DWPF may not be easily compensated for with sprint capacity. This worst case could result in an impact of no greater 2 months canister production downtime over the life of the facility.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 54,000	**Worst Case** 108,000	Worst Case; Worst case impact could be up to 2 months cumulative delay in production. Most likely and Best Case: Impacts could be up to 1 month cumulative delay in production.
Residual Schedule Impact :	1 Mth	1 Mth	2 Mths	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 54,000	**Worst Case** 108,000	Impacts based on outyear consequences only.
Residual Schedule Impact :	1 Mth	1 Mth	2 Mths	

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments: PBS-SR-0014 will provide temporary storage of failed melters, jumpers, vessels, etc.; however, their final disposition will be performed under PBS-SR-0030. For final disposition of failed equipment, this risk is an interface risk with PBS-SR-0030.

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Risk Assessment Form

ID Number: 090 **Revision:** 11 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Tank Farm Tank Availability and Infrastructure Does Not Support Salt Processing Operations			
Type: Risk, Internal, Technical	**Category:** Project Integration / Interfaces	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization & Disposition		
Responsible Org: SRR-OPS	**Contact:** Mike Borders	**Date Identified:** 4/3/2006	
Statement of Event: Tank Farm waste tank availability and associated infrastructure (IW System for Waste Removal, slurry pumps, dedicated transfer lines, etc.,) do not support the ability to prepare salt solution to feed the Salt Processing Facilities (ARP/MCU, SWPF) at planned processing rates.			
Likelihood:	Likely	**Basis:** Feed preparation for SWPF (9 Mgals/yr) results in a high integration demand. This is exacerbated by the system pinch points (e.g. DB7, DB8 etc.).	
Consequence / Benefit:	Severe (Critical)	**Basis:** Approximately 110 Mgals of salt solution remains to be processed. The processing is scheduled for completion in 14 years. In the worst case, the preparation and feeding of salt solution to SWPF could be significantly constrained, resulting in an extension to the program of up to 4 years (due to estimated loss of attainment).	
Most Significant Cost Impact ($k): 2,600,000		**Most Significant Schedule Impact :** 4 Yrs	
Level:	**High**	**Event Trigger:** Open start of SWPF processing; Close on completion of Salt processing.	
Handling Strategy:	Mitigate	**Description:** Enhanced modeling techniques are being employed to analyze time and motion of transfer and feed preparation strategies. From this modeling, the need for modifications to infrastructure can be identified and prioritized as appropriate.	
Handling Strategy Action Items: 090.1 Perform CORESim analysis of salt dissolution and feed preparation from salt dissolution to feed tanks (including transfers). Identify improvements necessary to reconfigure infrastructure and increase availability to meet salt processing demands., Pete Hill 090.2 Execute improvements identified by CoreSim modeling within the Tank Farms., Mike Borders			
HS Implementation Cost ($K):	0	**Basis:** Modeling costs are within the current cost baseline, however implementation of infrastructure modifications are not, however once identified they will be included.	
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 090 **Revision:** 11 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: A risk remains that Tank Farm waste tank availability and associated infrastructure (IW System for Waste Removal, slurry pumps, dedicated transfer lines, etc.,) do not support the ability to prepare salt solution to feed the Salt Processing Facilities (ARP/MCU, SWPF) at planned processing rates.

Residual Likelihood:	Likely	**Basis:** Likelihood has been reduced by infrastructure improvements and by the use of enhanced modeling to develop transfer and feed preparation strategies.
Residual Consequence:	Severe (Critical)	**Basis:** The worst case impact has been reduced by infrastructure upgrades and processing strategies which provide added flexibility in the operation of SWPF. The preparation and feeding of salt solution to SWPF and ARP/MCU could still be constrained, but with a lowered impact resulting in an extension to the program of up to 2 years (due to loss of attainment).
Residual Risk Level:	**High**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 650,000	**Most Likely** 650,000	**Worst Case** 1,300,000	Worst Case: Extension to the program of up to 2 years (approx 15% loss of attainment) Best and Most likely Cases: Extension to the program of up to 1 year (approx 8% loss of attainment)
Residual Schedule Impact :	1 Yr	1 Yr	2 Yrs	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 650,000	**Most Likely** 650,000	**Worst Case** 1,300,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	1 Yr	1 Yr	2 Yrs	

Risk Assumptions :

31. Tank Farm feed preparation infrastructure modifications required to support SWPF processing rates including:

-H-Tank Farm Blend tanks readiness for salt solution preparation

-F-Tank Farm Blend tanks readiness for salt solution preparation

-Tank 49 readiness as SWPF feed tank

-Mixing capabilities

-Enhanced transfer capabilities

-Transfer routes provided to feed tank.

Event Comments: This is an interface risk with SWPF for the first year of operations.

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Risk Assessment Form

ID Number: 091 **Revision:** 11 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Close Coupling-SWPF, DWPF, ARP/MCU and SPF Limits Waste Processing Throughput (Non-Chemistry)		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: SRR-OPS	**Contact:** Keith Harp	**Date Identified:** 4/3/2006

Statement of Event: The operations of SWPF, DWPF, and SPF (including SDUs) are closely coupled. (Also for a limited period, DWPF and ARP/MCU). The planned or unplanned shutdown of DWPF may affect the operation of SWPF due to limitations in lag storage for strip effluent. The planned or unplanned shutdown of SPF may also affect the operation of SWPF, however a larger DSS lag storage capacity is available via Tank 50 and will be in the future with the Salt Solution Receipt Tanks (SSRTs) at SPF.

Likelihood:	Very Likely	**Basis:** Even with coordinated outage planning, there is a likelihood that unplanned outages will occur. Detailed time and motion event modeling is underway and will be completed to identify "pinch points" that limit overall system throughput. When SWPF operations reach full capacity the close coupling of facilities is most critical. Based on past experience with major facilities there is a high likelihood that assumed combined processing rates may not be achieved.
Consequence / Benefit:	Significant	**Basis:** The life cycle plan currently projects that at peak an average of 9 Mgal of salt solution will be processed through SWPF during a year (accounting for planned outages). If unplanned outages in the existing LW facilities were to occur, it is estimated that the worst cumulative case would be up to ~16 months (ARP/MCU 1 week/yr for 4yrs; SWPF at [7.2M/gals/yr] 4 weeks per year for 2 yrs; SWPF at [9Mgals/yr] 5 weeks per year for 11 yrs) over the operating life cycle. (Loss of: 0.5 + 2.2 + 9.5 Mgals salt processing ~ 16 mths)

Most Significant Cost Impact ($k): 867,000	**Most Significant Schedule Impact :** 16 Mths

Level:	**High**	**Event Trigger:** Open on start of SWPF processing; Close on completion of SWPF processing.
Handling Strategy:	Mitigate	**Description:** COREsim modeling has been performed on several major areas of the LWO system and additional modeling will be performed to include ARP/MCU and help identify potential "fixes" to support a higher waste processing throughput. Facilities will maximize the use of redundancy, spares and predictive maintenance. Facilities will closely coordinate planned outages. Implementing modifications to DWPF (e.g. alternate reductant, TiO2 testing, maximum Cs canister content and water reduction modifications), SPF (e.g. SSRTs and increasing shift coverage).

Handling Strategy Action Items:

091.5 Collect reliability data from operation of facilities (actual throughput, planned and unplanned outages durations, etc.) and have salt IPT validate or if necessary rerun COREsim model with the latest reliability data., Pete Hill

091.6 Incorporate any necessary changes recommended from model analysis., To Be Assigned

HS Implementation Cost ($K):	0	**Basis:** Included within the baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: Some DWPF enhancements could be employed to achieve additional sprint capacity within DWPF should modeling results indicate it would be beneficial.

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Risk Assessment Form

ID Number: 091 **Revision:** 11 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: Implementation of mitigation strategies reduce the risk if the results are incorporated into the life cycle planning and facility configuration as required.

Residual Likelihood:	Likely	**Basis:** Likelihood has been reduced for DWPF strip effluent processing by incorporation of modeling results into operational strategies to fix "pinch points" and by issuance of lag storage report closing cost benefit analysis.
Residual Consequence:	Marginal	**Basis:** All strategies are implemented and lag storage in combination with sprint capacity is insufficient to avoid all unforced outages in other facilities. The cumulative impact is estimated at a 24 weeks.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 75,000	**Most Likely** 150,000	**Worst Case** 300,000	Worst Case: All strategies are implemented and lag storage in combination with sprint capacity is insufficient to avoid all unforced outages in other facilities. (24 Wks) Most likely: All strategies are implemented and lag storage in combination with sprint capacity is sufficient to avoid more of the unforced outages in other facilities. (12 Wks) Best Case: All strategies are implemented and lag storage in combination with sprint capacity is sufficient to avoid more of the unforced outages in other facilities. (6 Wks)
Residual Schedule Impact :	6 Wks	12 Wks	24 Wks	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 75,000	**Most Likely** 150,000	**Worst Case** 300,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	6 Wks	12 Wks	24 Wks	

Risk Assumptions :

2. ARP/MCU:

-No major modifications to ARP/MCU will be implemented to increase processing capacity to over 3 million gallons per year. Modifications that may be made including upgrading ARP/MCU facilities as required to maintain the operating rate for the extended life.

-ARP/MCU facilities operate to ensure the total Interim Salt Treatment curies emplaced in SPF are within the amount identified in Savannah River Site – Liquid Waste Disposition Processing Strategy (SRS LW Strategy), as amended by letter from the South Carolina Department of Health and Environmental Control (SCDHEC) to DOE-SR and the Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site.

-A seven-month outage in FY17 is planned, coincident with a DWPF melter change-out. This outage will allow for ARP/MCU facility upgrades, which may include contactor bearings, weir adjustment, etc.

-Nominally ARP/MCU will produce:

- For each gallon processed, ~1.2 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

3. The Salt Waste Processing Facility (SWPF) becomes operational December 3, 2018.

-Required Tank Farms, DWPF, and SPF modifications (e.g., Salt Disposition integration [SDI]) for SWPF, through Readiness Assessment (RA), will be complete two months prior to the initiation of the SWPF Operational Readiness Review (ORR)

4. SWPF nominal capacity is:

-4.625 Mgal/yr for the first year of operation

-7.2 Mgal/yr for the next two years of operation

-An SWPF outage is assumed at an appropriate time afetr the SWPF first year of operation to perform next generation solvent implementation to increase facility capacity to 9.0 Mgal/yr

-Nominally SWPF will produce:

- For each gallon processed, ~1.28 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Note: When production exceeds 7.2Mgal/yr, SE will be limited to 576 kgal/yr

11. A six-month DWPF outage, beginning July 2017, is required for SWPF tie-ins immediately prior to SWPF becoming operational. During this outage DWPF plans to implement productivity enhancements to support increased influents from SWPF. Note that this outage is coincident with the four-month melter outage.

18. During SWPF operation:

-SPF and SDF will support SWPF processing rates

-Additional operational time (i.e., multiple shifts, additional operating days each week, etc.) and adequate SDU receipt space to match production streams from SWPF are planned

-Modifications will provide sufficient contingency storage capacity to minimize impacts to SWPF or ETF due to SPF or SDF outages.

21. ETF is assumed to receive an average of 11 Mgal/yr:

-LW Evaporators: 5 Mgal/yr

-Savannah River Nuclear Solutions (SRNS) Facilities; 6 Mgal/yr Note: The agreement between SRNS and SRR for LW Receipt Services provides that the total maximum allocation for waste generated from SRNS facilities including H-Canyon, F-Canyon, the Waste Solidification Building, Mixed Oxide Facility, and miscellaneous smaller contributors is 15 Mgal/yr.

31. Tank Farm feed preparation infrastructure modifications required to support SWPF processing rates including:

-H-Tank Farm Blend tanks readiness for salt solution preparation
-F-Tank Farm Blend tanks readiness for salt solution preparation
-Tank 49 readiness as SWPF feed tank
-Mixing capabilities
-Enhanced transfer capabilities
-Transfer routes provided to feed tank.

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments: This is an interface risk with SWPF for the first year of operations.

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Risk Assessment Form

ID Number: 094 **Revision:** 10 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Available Tank Farm Space Cannot Support System Plan		
Type: Risk, Internal, Programmatic	**Category:** Resources/Conditions	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 4.0	**Assessable Element Title:** Process Radioactive Waste	
WBS Number: 01.90.03	**WBS Title:** Waste Treatment	
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 4/4/2006

Statement of Event: Space is required within the Tank Farms to receive and store waste resulting from processing and closure activities, e.g. DWPF recycle, heel removal, and ongoing and future Canyon missions, etc. Waste disposition activities must be meticulously planned and scheduled to maximize use of available tank working space. A risk exists that during waste disposition activities it is determined that tank space will not be available to perform all activities in support of the processing and closure milestones.

Likelihood:	Very Likely	**Basis:** Difficulties experienced with evaporator operations and space management have continued to challenge working tank space. Unexpected issues from old facilities and new processes will continue to require special measures for dispositioning waste and maintaining tank working space. Flammability concerns may result in the lowering of conductivity probes, resulting in volume reduction. Additional restrictions on the use of old-style tanks may exacerbate the likelihood of this event. Recent Evaporator issues have been experienced.
Consequence / Benefit:	Significant	**Basis:** Sludge batch preparation, waste removal, tank closure, salt batch preparation, evaporator performance etc., result in more waste than assumed during System Plan development. As a result, in the worst case, one or more of the tanks supporting SWPF feed preparation is required to accommodate this additional volume. CoreSim modeling indicates that if one of the tanks supporting SWPF feed preparation is required to support this, the ability to feed SWPF at the required rate will be impacted, reducing salt processing throughput from 9 Mgals/yr down to approximately 6 Mgals/yr for approximately 3 years. This reduction will impact the program 1 year.

Most Significant Cost Impact ($k): 650,000 **Most Significant Schedule Impact :** 1 Yr

Level:	**High**	**Event Trigger:** Currently open; Close upon completion of waste removal operations.
Handling Strategy:	Mitigate	**Description:** Working with planning on an ongoing basis to prepare and maintain integrated facility schedule for weekly transfer plan; Weekly meetings are conducted with Sludge Batch Team to prepare for sludge batch transfers; Statusing schedules and integrating with facility operations; Briefing Facility and Project Management regularly on tank working space issues to ensure an understanding of project implementation and facility operations impacts on tank working space; Periodically updating System Plan and supporting documents to stay in alignment with major facility operational start dates, processing rates and to account for any major emergent space issues; Identifying and implementing actions to achieve space gain within the Tank Farms and monitoring and optimizing Evaporator performance based on trending of results and applying corrective action. Investigate continued load sharing between Evaporators, Investigate reducing restrictions on old style tanks, extend ion echange processing capabilities. By using a no MST process, MCU throughput could be increased from 1.4Mgals/yr to 2Mgals/yr for an additional 12 month period achieving up to 600Kgal space gain.

Handling Strategy Action Items:

094.1 Pursue implementation of Ion Exchange to provide additional continued processing capability after deployment on Tank 10., Mark Keefer

094.2 Deploy a no MST process for ARP/MCU processing., Mark Keefer

HS Implementation Cost ($K):	0	**Basis:** In the baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: Eliminate DWPF recycle to the Tank Farms.

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Risk Assessment Form

ID Number: 094 **Revision:** 10 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: Continued delays will be experienced in waste disposition schedule.

Residual Likelihood:	Likely	**Basis:** Emergent issues and major assumption changes will continue to occur over the life of the program. These will continue to impact facility operations, operations activities and project schedules. Likelihood will have been reduced by deployment of additional processing capability.
Residual Consequence:	Marginal	**Basis:** Sludge batch preparation, waste removal, tank closure, salt batch preparation, evaporator performance etc., result in more waste than assumed during System Plan development. As a result, in the worst case, one or more of the tanks supporting SWPF feed preparation is required to accommodate this additional volume. CoreSim modeling indicates that if one of the tanks supporting SWPF feed preparation is required to support this, the ability to feed SWPF at the required rate will be impacted, reducing salt processing throughput from 9 Mgals/yr down to approximately 6 Mgals/yr for approximately 3 years. This reduction will impact the program 9 months (SWPF with the additional capability of processing will reduce the impact from 1 year to 9 months).
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	0	0	0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	108,000	325,000	488,000
Residual Schedule Impact :	2 Mths	6 Mths	9 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: Even with mitigation strategies, the worst case impact to the program could not be reduced below 9 months.

Most Likely: Advanced thinking and understanding of the program integration (System Plan) will allow decisions to be made in a timely fashion to reduce impacts to the program life such that the throughput is marginally reduced, with an impact of 6 months.

Best Case: Emergent space issues do impact, however by integrated system planning to result in no greater than 2 months impact to the program life cycle.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	108,000	325,000	488,000
Residual Schedule Impact :	2 Mths	6 Mths	9 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impacts based on risk having out-year consequences only.

Risk Assumptions :

30. Sufficient tank space volume is available to support the projected receipt of HLW into Tank 39 from H-Canyon operations through FY25. LLW waste, mainly from the General Purpose (GP) Evaporator, dispositioned in SPF are received into Tank 50 and direct discards of Pu and neptunium materials to the DWPF feed system are received into Tank 40, or Tank 51.

31. Tank Farm feed preparation infrastructure modifications required to support SWPF processing rates including:

-H-Tank Farm Blend tanks readiness for salt solution preparation

-F-Tank Farm Blend tanks readiness for salt solution preparation

-Tank 49 readiness as SWPF feed tank

-Mixing capabilities

-Enhanced transfer capabilities

-Transfer routes provided to feed tank.

Event Comments:

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Risk Assessment Form

ID Number: 100 **Revision:** 09 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Event Title: Waste Tank Utilization Conflict			
Type: Risk, Internal, Programmatic	**Category:** Resources/Conditions	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 2.0	**Assessable Element Title:** Store Liquid Radioactive Waste		
WBS Number: 01.90.02.01	**WBS Title:** F-H Tank Farm Facilities		
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 4/4/2006	
Statement of Event: LW planning assumes availability of tanks to meet the System Plan programmatic commitments. Use of a tank for purposes other than in the integrated plan may result in a long term delay of the program. A risk exists that emergent issues arise that require the continued long term use of a tank for supernate storage, and tank closure commitments may be further delayed.			
Likelihood:	Likely	**Basis:** Significant planning basis changes have been made over the last several years as the salt processing program is being redefined to account for SWPF startup delays and alternative salt processing being performed under the Waste Determination process. Changes are expected to continue as major processing assumptions continue to evolve and emergent issues are incorporated into the planning process.	
Consequence / Benefit:	Negligible	**Basis:** In the worst case, one or more of the tanks supporting SWPF feed preparation/sludge batch preparation is required to support other program needs (such as Aluminum dissolution, DWPF Recycle storage, DSS Storage, fresh waste receipt from H-Canyon, Evaporator salt receipt, etc.). In this case an old-style tank designated for closure will be utilized to alleviate the conflict and continue with processing. The additional expense of maintaining this tank past its closure date ($1M/year S&M cost) would be an additional near-term cost (assume worst case of 1 year). No program delays would be incurred.	
Most Significant Cost Impact ($k): 1,000		**Most Significant Schedule Impact :** 0	
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of waste removal operations.	
Handling Strategy:	Mitigate	**Description:** Continuing to improve the LWO System Planning process by: Increasing the accuracy of input data, modeling and by refinement and validation of assumptions; Identifying and resolving conflicting tank uses as any major assumptions change or as new issues arise; Working with internal and external stakeholders to communicate the System Plan and developing updates and issuing the System Plan.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** Cost of planning and continual improvement is included in the baseline.	
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 100 **Revision:** 09 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Statement of Residual Risk: A risk remains tank utilization conflicts will still exist.

Residual Likelihood:	Likely	**Basis:** Emergent issues and major assumption changes will continue to occur over the life of the program.
Residual Consequence:	Negligible	**Basis:** Even with mitigation strategies, the near-term impact could not be reduced.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 1,000	**Most Likely** 1,000	**Worst Case** 1,000	All Cases: Use of an additional tank for 1 year at an additional near-term cost of $1M.
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 1,000	**Most Likely** 1,000	**Worst Case** 1,000	Residual impact based on risk having near-term consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

30. Sufficient tank space volume is available to support the projected receipt of HLW into Tank 39 from H-Canyon operations through FY25. LLW waste, mainly from the General Purpose (GP) Evaporator, dispositioned in SPF are received into Tank 50 and direct discards of Pu and neptunium materials to the DWPF feed system are received into Tank 40, or Tank 51.

31. Tank Farm feed preparation infrastructure modifications required to support SWPF processing rates including:

-H-Tank Farm Blend tanks readiness for salt solution preparation

-F-Tank Farm Blend tanks readiness for salt solution preparation

-Tank 49 readiness as SWPF feed tank

-Mixing capabilities

-Enhanced transfer capabilities

-Transfer routes provided to feed tank.

Event Comments:

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Risk Assessment Form

ID Number: 102 **Revision:** 12 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: 2H Evaporator Impacted by DWPF Recycle Enrichment		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 3.0	**Assessable Element Title:** Concentrate Liquid Radioactive Waste	
WBS Number: 01.90.02.01	**WBS Title:** F-H Tank Farm Facilities	
Responsible Org: SRR-ENG	**Contact:** Thomas Huff	**Date Identified:** 4/4/2006

Statement of Event: The 2H Evaporator supports DWPF sludge batch processing and will support combined sludge and salt processing. DWPF recycle will be received by the Tank Farm. The 2H Evaporator is currently operated under an enrichment control program. Future processing by DWPF could result in a recycle stream that challenges enrichment levels in the 2H Evaporator. This results in a reduction in evaporator performance and subsequent decrease in space recovery versus what is assumed in the baseline.

Likelihood:	Unlikely	**Basis:** Based on WCS data, some future planned sludge batches are higher in enrichment than those processed to date. However, based on present data and planning, it is considered unlikely that 2H Evaporator will be impacted by recycle enrichment.
Consequence / Benefit:	Negligible	**Basis:** Evaporator if impacted by enrichment, would require more frequent cleaning. This cleaning would reduce Evaporator availability. The immediate impact would be that the Evaporator would be unavailable for up to 2 months while evaporator is being cleaned. In the worst case (assuming 2 cleanings as opposed to one cleaning per year), the Tank Farm should have sufficient space to store this recycle as the output of recycle from DWPF has been reduced and the beneficial reuse of recycle for salt batch preparation is planned. Additional near term cost of 5 additional evaporator cleanings over the near-term (5 years) and 17 in the outyears (17 years). Each additional cleaning would cost approximately $1M).

Most Significant Cost Impact ($k): 22,000	**Most Significant Schedule Impact :** 0

Level:	**Low**	**Event Trigger:** Currently open; Close upon shutdown of the 2H Evaporator.
Handling Strategy:	Mitigate	**Description:** Improved cleaning process is being developed.

Handling Strategy Action Items:

102.1 Develop and implement an improved cleaning process., John Schwenker

HS Implementation Cost ($K):	0	**Basis:** No additional cost.
HS Implementation Schedule:	0	**Basis:** No impact.

Other Handling Strategies: Investigate and deploy unit operation to avoid sending DWPF recycle to Tank Farm is not within the baseline (estimated at $50M).

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Risk Assessment Form

ID Number: 102 **Revision:** 12 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: Duration of cleaning has been reduced by the improved cleaning method, however the risk remains that more frequent cleanings will be required.

Residual Likelihood:	Unlikely	**Basis:** Based on WCS data, some future planned sludge batches are higher in enrichment than those processed to date. However, based on present data and planning, it is considered unlikely that 2H Evaporator will be impacted by recycle enrichment.
Residual Consequence:	Negligible	**Basis:** Evaporator if impacted by enrichment, would require more frequent cleaning. This cleaning would reduce Evaporator availability. The immediate impact would be that the Evaporator would be unavailable for up to 2 months while evaporator is being cleaned. In the worst case (assuming 2 cleanings as opposed to one cleaning per year), the Tank Farm should have sufficient space to store this recycle as the output of recycle from DWPF has been reduced and the beneficial reuse of recycle for salt batch preparation is planned. Additional near term cost of 5 additional evaporator cleanings over the near-term (5 years) and 17 in the outyears (17 years). The cost of each additional cleaning has been reduced to $750K by being able to perform the cleaning in one month as oppsed to two).
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	1,500	2,250	3,750
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

Worst Case: 5 additional Cleanings are required ($3.75M).

Most Likely Case: 3 additional cleanings are required ($2.25M).

Best Case: Two additional cleaning are required ($1.5M).

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	3,750	7,500	12,750
Residual Schedule Impact :	0	0	0

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: 17 additional Cleanings are required ($12.75M).

Most Likely Case: 10 additional cleanings are required ($7.5M).

Best Case: 5 additional cleaning are required ($3.75M).

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	5,250	9,750	16,500
Residual Schedule Impact :	0	0	0

Basis of LIFE CYCLE Cost and Schedule Impacts:

Based on total life cycle impact.

Risk Assumptions :

32. The 2H Evaporator System is used to evaporate DWPF recycle. The 3H Evaporator is used to process streams that minimize scale production, i.e., canyon wastes and sludge batch decants. The evaporator system feed and concentrate receipt tanks configuration is:

- 3H: Feed – Tank 32; Receipt – Tanks 30 and Tank 37
- 2H: Feed – Tank 43; Receipt – Tank 38.

Event Comments: See Risk Handling strategies on risks:

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Risk Assessment Form

ID Number: 116 **Revision:** 09 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Event Title: 2H Evaporator Material and Chemical Balance Issues			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 3.0	**Assessable Element Title:** Concentrate Liquid Radioactive Waste		
WBS Number: 01.30.03.01	**WBS Title:** F-H Tank Farm Facilities		
Responsible Org: SRR-ENG	**Contact:** John Contardi	**Date Identified:** 4/24/2006	

Statement of Event: The 2H Evaporator supports DWPF processing (recycle water handling). Unknown feed components or unexpected constituents are in evaporator feed. A risk exists that this results in not being able to process DWPF recycle and forces a decrease in space recovery versus what is assumed in the baseline.

Likelihood:	Likely	**Basis:** Due to the changing feed sources, unexpected constituents are likely and could cause evaporator processing impacts. Recent operational data indicates evaporator improvements are helping operational flexibility. DWPF modifications (purge modifications and caustic flowsheet) may have unanticipated impacts. Additionally, solids in DWPF recycle may produce adverse effects in Evaporator operation.
Consequence / Benefit:	Marginal	**Basis:** Recycle volumes are being reduced by modifications to DWPF and some beneficial reuse of recycle is ongoing (e.g. Tank 41 salt dissolution and salt batch preparation). These minimize the impact of 2H Evaporator becoming unavailable due to processing issues. When SWPF is brought on line, the beneficial use of recycle in salt dissolution will greatly reduce the impact of this risk event, however until that point in time for the near-term, the worst case impact would be a case where a chemical balance issue is encountered which requires the cessation of operations for up to 6 months while, flowsheet is modified. If Tank 22 is close to capacity (worst case) DWPF recycle could not be received. This would be a 6 month impact to the Program due to a 6 month stoppage at DWPF.

Most Significant Cost Impact ($k): 325,000 **Most Significant Schedule Impact :** 6 Mths

Level:	**Moderate**	**Event Trigger:** Currently open; Close upon shutdown of the 2H Evaporator.
Handling Strategy:	Avoid	**Description:** Make ready a back up strategy to transfer Tank 22 material to an alternate tank and then utilize Tank 22 for up to 6 months to receive and store DWPF recycle until flowsheet issues are resolved. Evaluate and implement SRR proposal initiatives for DWPF recycle reduction. Evaluate opportunities to remove solids from DWPF recycle.

Handling Strategy Action Items:

116.5 Evaluate and implement SRR proposal initiatives for DWPF recycle reduction., Eric Freed

116.7 Evaluate opportunities to remove solids from DWPF recycle., Eric Freed

HS Implementation Cost ($K):	0	**Basis:** Cost is within the baseline.
HS Implementation Schedule:	0	**Basis:** Will be completed within the schedule baseline.

Other Handling Strategies: None

PBS SR-0014 **Risk Assessment Form**

ID Number: 116 **Revision:** 09 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Statement of Residual Risk: Unexpected feed constituents may still be encountered in the 2H Evaporator feed, however the impact of this event has been avoided.

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

32. The 2H Evaporator System is used to evaporate DWPF recycle. The 3H Evaporator is used to process streams that minimize scale production, i.e., canyon wastes and sludge batch decants. The evaporator system feed and concentrate receipt tanks configuration is:

- 3H: Feed – Tank 32; Receipt – Tanks 30 and Tank 37
- 2H: Feed – Tank 43; Receipt – Tank 38.

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments: See also Risks 30 and 427.

PBS SR-0014 **Risk Assessment Form**

ID Number: 117 **Revision:** 10 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Oxalates from Acidic Tank Cleaning Cause Sludge/Salt Batch Preparation Problems		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 4.0	**Assessable Element Title:** Process Radioactive Waste	
WBS Number: 01.90.03	**WBS Title:** Waste Treatment	
Responsible Org: SRR-ENG	**Contact:** Richard Edwards	**Date Identified:** 4/24/2006

Statement of Event: Oxalates accumulate in the Tank Farm (most likely in evaporator feed/drop tanks). Oxalates are already present in the HLW system. Additional oxalates may be introduced during chemical cleaning and, to a lesser degree, from H-Canyon. Currently, the HLW System can dispose of oxalates via DWPF and Saltstone; disposition via these facilities is limited by the solubility of sodium oxalate (i.e., the higher the sodium concentration of the waste, the lower the sodium oxalate solubility). A risk exists that oxalates precipitate in evaporator feed/drop tanks limiting space and impacting salt dissolution from these tanks.

Likelihood:	Likely	**Basis:** Existing waste already contains oxalates and existing studies show DWPF can handle some additional oxalates without significant degradation of performance. Current DWPF sodium limits (for glass quality) require sludge batch washing to reduce the total sodium content to meet DWPF WAC limits. This washing dissolves the sodium oxalates and re-introduces the sodium oxalates back into the Tank Farm with wash water.
Consequence / Benefit:	Marginal	**Basis:** Based on sodium oxalate solubility, it is likely that oxalates have precipitated in evaporator feed/drop tanks. This could limit space and impact salt dissolution which could impact sludge and salt batch preparation. The worst case impact would be a direct Program extension of up to six months due to difficulties encountered during salt dissolution.

Most Significant Cost Impact ($k): 325,000 **Most Significant Schedule Impact :** 6 Mths

Level:	**Moderate**	**Event Trigger:** Open at start of processing tank cleaning waste; Close upon completion of waste removal operations.
Handling Strategy:	Mitigate	**Description:** As part of system planning, process heels are integrated into sludge batches to minimize impacts of oxalates. Flowsheets will be developed as part of the execution of chemical cleaning with OA for each tank to be chemically cleaned. Minimize the introduction of oxalates into the system wherever possible (during flowsheet development). Evaluate the need for chemical cleaning on a tank by tank basis as part of flowsheet development. Where chemical cleaning is determined to be required, evaluate the effectiveness of chemical cleaning vs the benefit with respect to system plan impacts. Use an ion exchange process (TCCR) on high oxalate bearing tanks and low sodium salt at end of Program. This would send DSS (containing oxalates) to saltstone.

Handling Strategy Action Items:

117.10 Evaluate the need for development of a disposition pathway (which may include permanent disposition in the Tank Farm, destruction of current Tank Farm oxalates, and/or methods to avoid further production/introduction [e.g., ECC] of oxalates into Tank Farm)., Richard Edwards

117.11 Deploy an ion exchange process (TCCR) on tanks with known high oxalate concentrations., Mark Keefer

117.6 Evaluate oxalate impact on Melter flammability., Ryan McNew

117.7 Evaluate the effectiveness of chemical cleaning vs the benefit with respect to system plan impacts based on experience and data gained. Issue report with recommendations for including in the System Plan., John Occhipinti

117.8 Update System Plan to incorporate the recommendations of report (117.7), Pete Hill

117.9 Develop and issue a report for the next group of tanks to undergo cleaning which evaluates and recommends a cleaning strategy., John Occhipinti

HS Implementation Cost ($K):	0	**Basis:** Activities are included in the baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: Perform a study to collect data and create a predictive cleaning model. Develop a capability within DWPF to allow a switch to "salt-only" canisters should sludge feed be unavailable. Investigate further heel removal techniques. Investigate and deploy an alternative cleaning method (e.g., alternative acid for cleaning, cleaning which targets specific radionuclides or other species).

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ID Number: 117 **Revision:** 10 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: After deploying mechanical cleaning (e.g. using four pumps instead of three) and integrating heel removal with sludge batch processing, impacts from oxalates may still remain if some chemical cleaning is required.

Residual Likelihood:	Unlikely	**Basis:** The likelihood has been reduced.
Residual Consequence:	Marginal	**Basis:** The worst case impact has been reduced to a direct Program extension of up to three months due to difficulties encountered during salt dissolution.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 108,000	**Worst Case** 163,000	Worst Case: Oxalate processing impacts the Program up to 3 months. Most likely case: Oxalate processing impacts the Program up to 2 months. Best case: Oxalate processing impacts the Program up to 1 month.
Residual Schedule Impact :	1 Mth	2 Mths	3 Mths	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 108,00	**Worst Case** 163,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	1 Mth	2 Mths	3 Mths	

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

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Risk Assessment Form

ID Number: 120 **Revision:** 10 **Last Date Evaluated:** 2/10/2016 **Status:** Active

Event Title: Sludge Batch Preparation Impacted by Slow Settling Rate			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.2	**Assessable Element Title:** Sludge Processing		
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations		
Responsible Org: SRR-ENG	**Contact:** Richard Edwards	**Date Identified:** 4/3/2006	
Statement of Event: Sludge batch preparation is impacted by slower than expected settling rate (higher interface) due to chemistry or physical properties.			
Likelihood:	Very Likely	**Basis:** Experience to date with previous sludge batches (sludge batches 4 and 5) demonstrated that this may occur.	
Consequence / Benefit:	Marginal	**Basis:** A slow sludge settling rate impacts sludge washing and its associated decants. This could result in an extended sludge processing schedule and a higher than forecast volume of washwater. Sludge feed would not be available for DWPF. Assuming two batches are affected this would delay the completion of sludge processing up to 6 Mths. This will impact the Program end date up to 6 Mths.	
Most Significant Cost Impact ($k): 325,000		**Most Significant Schedule Impact :** 6 Mths	
Level:	**Moderate**	**Event Trigger:** Currently open; Close on completion of Sludge Processing.	
Handling Strategy:	Mitigate	**Description:** As part of the current program, sludge settling data will be incorporated into the sludge batch preparation plan to minimize impacts from slow settling rates. As part of the ongoing sludge batch preparation process, evaluations are made on the need for obtaining early samples from the waste tank from which the sludge batch feed will be removed.	
Handling Strategy Action Items: 120.2 Evaluate opportunities to revise DSA to increase duration between pump runs to minimize shearing and maximize settling time (e.g. Evaluate hydrogen generation calculations for increasing time between pump runs)., Ryan McNew			
HS Implementation Cost ($K):	0	**Basis:** Within the current cost baseline.	
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.	
Other Handling Strategies: Issue an RFP to design, fabricate and cold test a technology for in-situ measurement of gas retention. Investigate methods to improve filtration flux in cross-flow filters. Re-evaluate the use of rotary microfilters. Evaluate opportunities to revise DSA to increase duration between pump runs to minimize shearing and maximize settling time. Evaluate flammability controls to allow longer settling times (increased Q times allowing larger decants) (this strategy is not being pursued as no margin is available in DSA calculation). Evaluate flowsheet to identify any chemical addition or other method to facilitate settling or maximize decanting.			

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Risk Assessment Form

ID Number: 120 **Revision:** 10 **Last Date Evaluated:** 2/10/2016 **Status:** Active

Statement of Residual Risk: A risk remains that sludge batch preparation is impacted by slower than expected settling rate (higher interface) due to chemistry or physical properties.

Residual Likelihood:	Unlikely	**Basis:** Likelihood has been reduced by maximizing settlement time through planning and sampling.
Residual Consequence:	Marginal	**Basis:** A slow sludge settling rate impacts sludge washing and it's associated decants. This could result in an extended sludge processing schedule and a higher than forecast volume of washwater. Sludge feed would not be available for DWPF. Assuming one batch is affected this would delay the completion of sludge processing up to 3 Mths. The end date for the program will be extended as the sludge feed break would result in DWPF being unable to receive SWPF effluents. This will impact the Program end date up to 3 Mths.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 108,000	**Worst Case** 163,000	Worst case: Worst case will be mitigated, therefore residual risk worst case is lessened to a sludge processing program extension of 3 Mths.
Residual Schedule Impact :	1 Mth	2 Mths	3 Mths	Most likely: Sludge processing program extension of 2 Mths. Best Case: Sludge processing program extension of 1 Mth.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 108,000	**Worst Case** 163,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	1 Mth	2 Mths	3 Mths	

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

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Risk Assessment Form

ID Number: 121 **Revision:** 08 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Salt Dissolution Creates Greater Than Expected Volume of Salt Solution			
Type: Risk, Internal, Technical	**Category:** Resources/Conditions	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 4/4/2006	
Statement of Event: Ineffective salt dissolution in salt tanks, due to channeling, non-uniform salt dissolution or feed preparation windows will impact the rate of salt removal and the associated salt solution volume generated. A risk exists that a greater volume of salt solution is produced which impacts the salt processing plan.			
Likelihood:	Unlikely	**Basis:** Generally, salt dissolution has shown that the dissolution process has not required additional volumes of dissolution liquid to dissolve salt when sufficient contact time is allowed. However, recent experience with salt dissolution on Tank 37 using a feed and bleed process indicated a greater than anticipated volume of water was needed to dissolve salt in the window planned for salt dissolution. Hooper jets are being used (low volume mixing jets) to decrease the likelihood of channeling.	
Consequence / Benefit:	Significant	**Basis:** A greater volume of salt solution will reduce the overall volume available for storage in the Tank Farm and create the need for processing of a larger volume of salt solution which slows down the overall processing schedule. Inability to remove all planned salt will result in less space being available for future use in the applicable tank and potentially greater volume of liquid. In the worst case, if the ratio of water to dissolved salt encountered on Tank 37 were to occur on a limited number of remaining salt tanks, there would be an additional 9Mgals of salt solution to be processed over the life of the Program. This additional salt solution would be processed at 9Mgals/yr through SWPF, extending the Program by 1yrs.	
Most Significant Cost Impact ($k): 650,000		**Most Significant Schedule Impact :** 1 Yr	
Level:	**Moderate**	**Event Trigger:** Currently open; Close upon completion of salt processing.	
Handling Strategy:	Mitigate	**Description:** Currently, before salt dissolutions are performed, lessons learned from previous salt dissolution activities are reviewed and incorporated into the proposed salt dissolution strategy. Evaluate the need to conduct additional salt characterization and perform as deemed necessary. Evaluate various methods of salt dissolution to determine most effective method.	
Handling Strategy Action Items: 121.3 Evaluate various methods of salt dissolution to determine most effective method (more cost effective and/or more operationally efficient, considering chemistry and hardware)., John Occhipinti			
HS Implementation Cost ($K):	0	**Basis:** In the baseline.	
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.	
Other Handling Strategies: Maintain liquid level above salt surface. Develop a complex-wide database to share information on waste retrieval, tank cleaning and tank sampling and it use to obtain a better understanding of salt dissolution.			

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Risk Assessment Form

ID Number: 121 **Revision:** 08 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: Even with the application of lessons learned, use of new salt dissolution techniques and development of a SWPF feed preparation strategy including minimization of impacts from realizing this risk, a risk remains that a greater volume of salt solution is produced which impacts the salt processing plan.

Residual Likelihood:	Very Unlikely	**Basis:** Salt is highly soluble and given enough time, with additional agitation, saltcake can be removed.
Residual Consequence:	Significant	**Basis:** A large portion of the salt remains in the tanks requiring additional dissolution activities, creating a larger volume to be processed, extending program by up to 1 year.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 163,000	**Most Likely** 325,000	**Worst Case** 650,000	Worst case: A large portion of the salt remains in the tanks requiring additional dissolution activities, creating a larger volume to be processed, extending program by up to 1 year.
Residual Schedule Impact :	3 Mths	6 Mths	1 Yr	Most Likely Case: Salt remains in the tanks requiring additional dissolution activities, creating a larger volume to be processed, extending program by up to 6 months. Best case: Some salt remains in the tanks requiring additional dissolution activities, creating a larger volume to be processed, extending program by up to 3 months.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 163,000	**Most Likely** 325,000	**Worst Case** 650,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	3 Mths	6 Mths	1 Yr	

Risk Assumptions :

Salt processing and salt batch need dates are projected by the Salt Batch Plan.

Event Comments:

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Risk Assessment Form

ID Number: 129 **Revision:** 09 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Slower Salt Dissolution Rates Force Schedule Delays			
Type: Risk, Internal, Technical	**Category:** Technology	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 4/4/2006	
Statement of Event: Salt processing rates are established based on previous dissolution evolutions. A risk exists that slower salt dissolution rates are encountered and force schedule delays.			
Likelihood:	Unlikely	**Basis:** Salt Batch planning allows for 50% attainment, i.e., dissolution process down time. Previous experience in Tank 41, 25 and Tank 37 (twice) have demonstrated this dissolution performance. However, to date only the upper portions of saltcake within a tank have been dissolved. Also, precipitated NAS will add to the insoluble solids already in saltcake. As the saltcake is dissolved, the insoluble solids accumulate in a relatively low permeable layer covering the saltcake. This layer may impede liquid flow into the saltcake and increase the total cycle time needed to complete dissolution. Use of Hooper jets decrease the likelihood of forming an insoluble layer on top of the salt.	
Consequence / Benefit:	Marginal	**Basis:** Slower dissolution rates would lead to longer dissolution times to achieve the same water usage rates or use more water to dissolve the same saltcake. Assume that program is impacted by 3 Mths to allow for additional delays or processing time for additional volume.	
Most Significant Cost Impact ($k): 163,000		**Most Significant Schedule Impact :** 3 Mths	
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of last salt dissolution.	
Handling Strategy:	Mitigate	**Description:** As part of the program, salt dissolution campaigns are monitored and their results fed back into Program planning activities. Apply lessons learned from previous salt dissolution activities e.g. Tanks 41, 25 and 37. Evaluate various methods of salt dissolution to determine most effective method.	
Handling Strategy Action Items: 129.1 Develop and Evaluate various methods of salt dissolution to determine most effective method., John Occhipinti			
HS Implementation Cost ($K):	0	**Basis:** Within the current baseline.	
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.	
Other Handling Strategies: Identify new methods of obtaining rapid, high quality tank farm characterization data and develop to maturity. Develop a database on waste retrieval across the DOE complex and utilize to identify methods of improving salt dissolution.			

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Risk Assessment Form

ID Number: 129 **Revision:** 09 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: There are some potential adjustments to the plan that may be caused by a delay in salt processing.

Residual Likelihood:	Very Unlikely	**Basis:** Dissolution planning based on sampling results will allow the likelihood to be reduced by optimizing the dissolution process.
Residual Consequence:	Marginal	**Basis:** Slower dissolution rates would lead to longer dissolution times to achieve the same water usage rates or use more water to dissolve the same saltcake. Assume that program is impacted by 3 Mths to allow for additional delays or processing time for additional volume.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 25,000	**Most Likely** 54,000	**Worst Case** 163,000	Worst Case: Actual salt dissolution rates do not meet expected dissolution rates, resulting in a program delay of up to 3 months.
Residual Schedule Impact :	2 Wks	1 Mth	3 Mths	Most Likely Case: Some salt dissolution rates do not meet expected dissolution rates resulting in a program delay of up to 1 month. Best Case: Some salt dissolution rates do not meet expected dissolution rates resulting in a program delay of up to 2 weeks.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 25,000	**Most Likely** 54,000	**Worst Case** 163,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	2 Wks	1 Mth	3 Mths	

Risk Assumptions :

Salt processing and salt batch need dates are projected by the Salt Batch Plan.

Event Comments:

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Risk Assessment Form

ID Number: 145 **Revision:** 10 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Limited DWPF Laboratory Capabilities Challenged by New Constituents			
Type: Risk, Internal, Technical	**Category:** Project Integration / Interfaces	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste		
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations		
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 4/5/2006	
Statement of Event: A risk exists that the existing statistically qualified DWPF laboratory methods did not take into account some constituents of a new sludge batch. Therefore, the analytical information needed for process control is inaccurate. The limited analytical capabilities of the DWPF laboratory either partially or totally constrain canister production until new analytical methods are developed and qualified for use.			
Likelihood:	Likely	**Basis:** Previously, this problem has been encountered (Reference: DWPF Vulnerability Report, G-ESR-S-00012), however, as part of each sludge batch processing prerequisites, a validation of the analytical techniques will be performed and modifications and/or adjustments made prior to the start of processing.	
Consequence / Benefit:	Marginal	**Basis:** Assumes this risk would delay the start of a new sludge batch stopping canister production while the laboratory/analysis technique is reconfigured. This is assumed to occur for several sludge batches for a total impact to canister production of 3 months delay to the program.	
Most Significant Cost Impact ($k): 163,000		**Most Significant Schedule Impact :** 3 Mths	
Level:	**Moderate**	**Event Trigger:** Open upon start of new sludge batch processing; close upon completion of DWPF processing.	
Handling Strategy:	Accept	**Description:** Accepted as part of the current program, each sludge batch preparation schedule includes a validation of the existing laboratory analytical methods by SRNL to identify if any new sludge constituents interfere with the existing analysis techniques. Where analytical methods and/or equipment are not adequate, replacement and modifications are performed.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** Within current baseline	
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.	
Other Handling Strategies: Identify new methods of obtaining rapid, high quality tank farm characterization data and develop to maturity.			

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Risk Assessment Form

ID Number: 145 **Revision:** 10 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: A risk remains that new constituents impact DWPF laboratory processes causing an impact to production as the time needed to reconfigure the laboratory and analytical techniques will be a direct delay to sludge processing.

Residual Likelihood:	Likely	**Basis:** Potential still exists that an unknown constituent could affect the existing DWPF laboratory analytical methods after an SRNL validation.
Residual Consequence:	Marginal	**Basis:** Sludge batches experience a delay assumed at 3 months over the life of the Program.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 25,000	**Most Likely** 54,000	**Worst Case** 163,000
Residual Schedule Impact :	2 Wks	1 Mth	3 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: Sludge batches experience a reduced delay assumed at 3 months over the life of the Program.

Most Likely Case: Sludge batches experience minor delays assumed at 1 month over the life of the Program.

Best Case: Sludge batches experience minimal delays assumed at 2 weeks over the life of the Program.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 25,000	**Most Likely** 54,000	**Worst Case** 163,000
Residual Schedule Impact :	2 Wks	1 Mth	3 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on risk having out-year consequences only.

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

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Risk Assessment Form

ID Number: 149 **Revision:** 10 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Event Title: HLW Tank Leak Requires the Use of Contingency Space		
Type: Risk, Internal, Programmatic	**Category:** Process Performance - Equip./Infrastr.Failures	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 2.0	**Assessable Element Title:** Store Liquid Radioactive Waste	
WBS Number: 01.90.02.01	**WBS Title:** F-H Tank Farm Facilities	
Responsible Org: SRR-OPS	**Contact:** Mike Borders	**Date Identified:** 4/5/2006

Statement of Event: A risk exists that a waste tank leak develops in a compliant or type IV tank being used to store or process radioactive material that requires the use of tank farm contingency space (1,300,000 gallons).

Likelihood:	Unlikely	**Basis:** While tank leaks within the tank farms have occurred, generally those impacting tank farm contingency space would be limited to tanks being used for storage and processing (tanks currently undergoing closure are excluded from this risk), however some non-compliant tanks, similar to the types that have previously leaked, do fall into this category.
Consequence / Benefit:	Severe (Critical)	**Basis:** In the worst case, a tank which is critical to near-term processing would leak in a manner that would require it to be completely emptied and use most of the reserved contingency space (tank is near full when leak occurs and leak occurs close to the bottom of the tank). The recovery process would be to redistribute the material within the available tank farm compliant space and operate facilities at sprint capacities to regain a qualified contingency volume. Once the contingency volume is attained, the planned activities would resume. A worst case impact to the program is estimated at 2 years (e.g. Tank 49 leaks during SWPF operation and requires repurposing of tank(s), and waste transfers from those tanks being repurposed, etc.). The recovery process could include: establishing a means to regain sufficient space to restart processing (performing transfers, dissolutions, volume reduction, deploying equipment), and remediation of sludge and/or salt batches affected. Additionally, restart of facilities and processing could be at much slower rates (sufficient space may not be available to prepare and process large batches) further adding to overall Program impact.

Most Significant Cost Impact ($k): 1,300,000	**Most Significant Schedule Impact :** 2 Yrs

Level:	**Moderate**	**Event Trigger:** Currently open; Close upon completion of waste removal operations.
Handling Strategy:	Mitigate	**Description:** Salt processing is planned to achieve space gain and tank chemistry control programs prevent tank conditions that facilitate leak development.

Handling Strategy Action Items:

149.3 Ensure through system planning that temporary contingency space is available in closure tanks in accordance with this strategy., Pete Hill

149.5 Evaluate the need to oxalic acid clean tanks and if evaluated as not having a favorable cost benefit, pursue closure without OA cleaning. (This will help reduce tank space pressure and lessen impact relative to available contingency space), Ryan McNew

HS Implementation Cost ($K):	0	**Basis:** Developing strategies and planning are within the baseline cost.
HS Implementation Schedule:	0	**Basis:** Planning and strategy development can be performed without impact to the baseline schedule.

Other Handling Strategies: Develop new methods of repairing tanks in-situ. Develop an RFP to design and test technologies for tank repair.

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Risk Assessment Form

ID Number: 149 **Revision:** 10 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Statement of Residual Risk: A risk remains that a tank leak may still occur.

Residual Likelihood:	Unlikely	**Basis:** While leaks to tanks within the tank farms are likely, those leading to an impact to the tank farm contingency space further into the waste processing program are unlikely.
Residual Consequence:	Severe (Critical)	**Basis:** In the worst case, a tank which is critical to near-term processing would leak in a manner that would require it to be completely emptied and use most of the reserved contingency space (tank is near full when leak occurs and leak occurs close to the bottom of the tank). The recovery process would be to redistribute the material within the available tank farm compliant space and operate facilities at sprint capacities to regain a qualified contingency volume. Once the contingency volume is attained, the planned activities would resume. A worst case impact to the program is estimated at 2 years (e.g. Tank 49 leaks during SWPF operation and requires repurposing of tank(s), and waste transfers from those tanks being repurposed, etc.). The recovery process could include: establishing a means to regain sufficient space to restart processing (performing transfers, dissolutions, volume reduction, deploying equipment), and remediation of sludge and/or salt batches affected. Additionally, restart of facilities and processing could be at much slower rates (sufficient space may not be available to prepare and process large batches) further adding to overall Program impact.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 325,000	**Most Likely** 650,000	**Worst Case** 1,300,000	Worst Case: Critical tank with lower leak site, Program delay of 2 years. Most Likely Case: Critical tank with mid-level leak, Program delay of 1 year. Best Case: Non-critical tank leak, Program delay of up to 6 months.
Residual Schedule Impact :	6 Mths	1 Yr	2 Yrs	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 325,000	**Most Likely** 650,000	**Worst Case** 1,300,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	6 Mths	1 Yr	2 Yrs	

Risk Assumptions :

30. Sufficient tank space volume is available to support the projected receipt of HLW into Tank 39 from H-Canyon operations through FY25. LLW waste, mainly from the General Purpose (GP) Evaporator, dispositioned in SPF are received into Tank 50 and direct discards of Pu and neptunium materials to the DWPF feed system are received into Tank 40, or Tank 51.

Event Comments: This likelihood of this event is greater in the near term (7- 10 yrs) as space is limited and a high volume of waste is contained in old-style tanks which are more likely to leak than new-style tanks. It is assumed that as part of safe storage of waste, funding will be maintained for tank space management, leak detection monitoring programs, and tank management programs (corrosion control programs etc.). If a tank leak in a type III tank occurs or another tank that impacts tank space, a mitigation effort will be needed to secure additional tank space. This is an interfacing risk with H-Canyon (PBS-SR-0011/12).

PBS SR-0014

Risk Assessment Form

ID Number: 166 **Revision:** 12 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Event Title: TiO2 Limits Within DWPF WAC Cannot be Sufficiently Raised to Support Salt Processing		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 4.1.2	**Assessable Element Title:** SWPF Salt Processing	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: SRR-OPS	**Contact:** Keith Harp	**Date Identified:** 5/11/2006

Statement of Event: The current TiO2 limit for DWPF as specified in the DWPF WAC is 2 wt%. When SWPF is operating at full capacity (9 Mgals/yr), this WAC limit for TiO2 is projected to be exceeded. It is assumed that the DWPF WAC limit for TiO2 can be raised to accommodate SWPF operating at full capacity. A risk exists that testing indicates glass quality cannot be achieved with the TiO2 loading produced from SWPF operating at full capacity.

Likelihood:	Unlikely	**Basis:** Currently MST is allowed to 0.4 g/l for 80% of production and a 2 strike mode (producing waste at 0.8 g/l) for 20% of production. This level of MST will most certainly reduce throughput to DWPF as DWPF cannot process this rate of MST at the full throughput of SWPF. The potential for increasing the number of SWPF double strikes exists. Process parameters can be adjusted at SWPF to optimize MST use. Preliminary testing indicates that increasing the TiO2 upper limit to 6 wt% is feasible. Even with a significant increase in the percentage of double strikes by SWPF, it is considered unlikely that the DWPF WAC limit cannot be raised to accommodate the TiO2 produced in the SWPF waste.
Consequence / Benefit:	Very Severe (Crisis)	**Basis:** If this risk is realized, in the worst case, the impact to the program could be a reduced throughput at SWPF (limited to 3 Mgals/yr). At this reduction an additional 17 year impact to the Program would be realized.

Most Significant Cost Impact ($k): 11,050,000	**Most Significant Schedule Impact :** 17 Yrs

Level:	**High**	**Event Trigger:** Open upon start of SWPF processing; Close on completion of salt processing.
Handling Strategy:	Avoid	**Description:** Salt batches will be planned to minimize the amount of MST required where possible (this will only marginally help mitigate this risk). During processing, tailor the MST usage to the salt batch and tailor double strike to reduced titanium loading in each batch. Include these changes into operating procedures. This risk may be avoided by the development of glass formulations capable of higher Ti loading. Investigate, test and develop a modified SWPF flowsheet to use mMST.

Handling Strategy Action Items:

166.1 Perform Experimental work to identify new compositional limits (including PCCS evaluation of System Plan 20 Changes)., Byron Neely

166.2 Issue a DWPF WAC that allows for maximum TiO2 levels without reducing SWPF throughput., Jeff Ray

166.4 Perform mathematical model revision (PCCS)., Byron Neely

166.5 Implementation of revised model in facility procedures and processes., Eric Freed

166.6 During processing, tailor the MST usage to the salt batch and tailor double strike to reduced titanium loading in each batch. Include these changes into operating procedures., Pam Marks

166.7 Perform investigation into the use of mMST and if feasible modify the SWPF flowsheet to use mMST., Pam Marks

HS Implementation Cost ($K):	0	**Basis:** Cost for implementation of development and deployment of improved glass TiO2 loading is within the current baseline.
HS Implementation Schedule:	0	**Basis:** Schedule for TiO2 testing has been incorporated in the SRR baseline without impacting the overall Program.

Other Handling Strategies: None

PBS SR-0014 **Risk Assessment Form**

ID Number: 166 **Revision:** 12 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Statement of Residual Risk: This risk has been avoided.

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

4. SWPF nominal capacity is:

-4.625 Mgal/yr for the first year of operation

-7.2 Mgal/yr for the next two years of operation

-An SWPF outage is assumed at an appropriate time afetr the SWPF first year of operation to perform next generation solvent implementation to increase facility capacity to 9.0 Mgal/yr

-Nominally SWPF will produce:

- For each gallon processed, ~1.28 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Note: When production exceeds 7.2Mgal/yr, SE will be limited to 576 kgal/yr

Event Comments: Refer to RAMP, (V-RMP-J-00001), Support Program-1.

PBS SR-0014

Risk Assessment Form

ID Number: 168 **Revision:** 13 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Event Title: SWPF Does Not Achieve System Plan Throughput / Attainment			
Type: Risk, Internal, Programmatic	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1.2	**Assessable Element Title:** SWPF Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: DOE-SR	**Contact:** Pat Suggs	**Date Identified:** 5/15/2006	

Statement of Event: Several risks have been identified by the SWPF EPC contractor which are being handled as part of the SWPF Project. A risk exists that after handling, an accepted risk may impact operation of SWPF. In addition, unknown risks may emerge during commissioning, that could negatively impact operations and the Liquid Waste Program. These operational risks will be applicable to SWPF after turnover to the selected long term operator (LTO). This is not a SWPF project risk.

Likelihood:	Very Likely	**Basis:** It is very likely that unforeseen outages will occur that are above the 75% attainment planned for SWPF operations. A worst case outage would be emulsification of the waste/solvent stream which could take up to 6 weeks to remediate. However, during the years prior to full capacity (9 Mgals/yr) operations in 2022, a sprint capacity will be available to avoid impact to the Program. The duration of operations at 4.6 Mgals/year ramping up to 7.2 Mgals/year is approximately 3 years which should allow attainment to be optimized. Additionally, as the EPC contractor is required to operate the SWPF for one year after commissioning, the EPC contractor will gain valuable knowledge that should decrease long-term operational risk.
Consequence / Benefit:	Significant	**Basis:** It is assumed that over the remaining operation period, a cumulative worst case delay of up to 18 months could be realized over the liquid waste Program lifecycle.
Most Significant Cost Impact ($k): 975,000		**Most Significant Schedule Impact :** 18 Mths
Level:	**High**	**Event Trigger:** Open start of SWPF processing; Close on completion of SWPF processing.
Handling Strategy:	Mitigate	**Description:** The process will be optimized based on incorporation of ARP/MCU lessons learned and data on actual SWPF operating experience (optimize operating parameters e.g. molarity [Na], solvent composition etc.) to lower the likelihood of this event and to also develop additional capacity for salt processing to recover from unforeseen outages. These strategies effectively mitigate the consequences of this risk. Investigate developing sprint capacity and/or work arounds allowing downstream facilities to match SWPF sprint capacity above 9 Mgals/yr to ascertain if this is a viable strategy to pursue.

Handling Strategy Action Items:

168.1 Investigate developing sprint capacity and/or work arounds allowing downstream facilities to match SWPF sprint capacity above 9 Mgals/yr to ascertain if this is a viable strategy to pursue., Pete Hill, Completed, 3/21/2016

HS Implementation Cost ($K):	0	**Basis:** Modifications to improve downstream facilities sprint capacity are not within current baseline, however, if identified as necessary they would be planned.
HS Implementation Schedule:	0	**Basis:** Included in SWPF Project Schedule.

Other Handling Strategies: None

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Risk Assessment Form

ID Number: 168 **Revision:** 13 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Statement of Residual Risk: A risk remains that SWPF does not achieve a 75% attainment.

Residual Likelihood:	Likely	**Basis:** Likelihood has been reduced by incorporating operating lessons learned and providing additional sprint capacity at downstream facilities.
Residual Consequence:	Significant	**Basis:** It is assumed that over the remaining operation period, a cumulative worst case delay of up to 18 months could be realized over the Liquid Waste Program lifecycle.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 325,000	**Most Likely** 650,000	**Worst Case** 975,000	Worst Case: A cumulative delay of up to 18 months. Most Likely case: A cumulative delay of up to 12 months. Best case: A cumulative delay of up to 6 months.
Residual Schedule Impact :	6 Mths	12 Mths	18 Mths	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 325,000	**Most Likely** 650,000	**Worst Case** 975,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	6 Mths	12 Mths	18 Mths	

Risk Assumptions :

4. SWPF nominal capacity is:

-4.625 Mgal/yr for the first year of operation

-7.2 Mgal/yr for the next two years of operation

-An SWPF outage is assumed at an appropriate time afetr the SWPF first year of operation to perform next generation solvent implementation to increase facility capacity to 9.0 Mgal/yr

-Nominally SWPF will produce:

- For each gallon processed, ~1.28 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Note: When production exceeds 7.2Mgal/yr, SE will be limited to 576 kgal/yr

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 174 **Revision:** 08 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Tank Cleaning Not Sufficient for Tank Closure (DOE Risk)			
Type: Risk, Internal, Technical	**Category:** Technology	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 6.0	**Assessable Element Title:** Closure (Tanks, Evap. & Ancil. Equip) Including Heel Removal		
WBS Number: 01.90.01	**WBS Title:** Waste Removal and Tank Closure		
Responsible Org: SRR-ENG	**Contact:** John Occhipinti	**Date Identified:** 2/1/2007	
Statement of Event: A risk exists that tank cleaning leaves residual waste which does not meet 3116 Waste Determination (WD) requirements, particularly waste removal to the maximum extent practical [MEP] (e.g. another technology is identified with a significantly greater potential for achieving a better cleaning performance) or Performance Assessment (PA) requirements.			
Likelihood:	Unlikely	**Basis:** The tank cleaning schedule and the further residual waste removal within the near-term presents challenges in system and project planning, and technology development and its deployment. Several tanks may have material rheology considerations and Type I and Type II Tanks have cooling coils that present accessibility and waste removal considerations. To date MEP has been achieved on six tanks. Realization of this risk is more likely in the near term than in the later years because of lessons learned, successes, and maturing of cleaning technologies which will reduce the likelihood of this risk in the future.	
Consequence / Benefit:	Significant	**Basis:** Although more likely in the near-term, the worst case impact would be realizing this risk on one of the final tanks to be cleaned. Insufficient waste removal will require further development and testing of more sophisticated cleaning technology and is assumed to delay the overall program by 1 year (assuming new technology is identified after submission of closure documentation). The implementation cost could be up to $20M for evaluation, development and deployment of the improved cleaning technology. This consequence is anticipated to lessen as successes are achieved and cleaning technology matures. An impact at the end of the program would be limited to the closure and waste processing activities necessary for the cleaning and closure of one tank, therefore the cost would be up to $50M (cost to send waste to offsite disposal or utilize a small melter to stabilize the waste). The end of the program is delayed by 1 year, but there are no additional facility costs as other facilities are allowed to shut down and decommission as scheduled.	
Most Significant Cost Impact ($k): 70,000		**Most Significant Schedule Impact :** 1 year	
Level:	**Moderate**	**Event Trigger:** Currently open: Close at the end of the last tank closure.	
Handling Strategy:	Mitigate	**Description:** Currently, investigation and evaluation of new technologies for mechanical and chemical cleaning is part of the program as well as working with the other DOE Sites and National Laboratories through conferences e.g. annual Waste Management Conference and Tank Waste Corporate Board, to improve or develop new technologies. Lessons learned from previous successes on implementing tank cleaning technologies are continuously incorporated to improve the closure process.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** Within the cost baseline.	
HS Implementation Schedule:	0	**Basis:** Completed within System Plan schedule baseline.	
Other Handling Strategies: Develop a predictive cleaning model.			

PBS SR-0014

Risk Assessment Form

ID Number: 174 **Revision:** 08 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: Even after significant effort is made to implement lessons learned and to deploy new cleaning technology adaptable to different tank configurations and tank waste characteristics, not all WD requirements can be met and delays are encountered until resolutions can be developed.

Residual Likelihood:	Very Unlikely	**Basis:** After applying lessons learned and new technologies to Tank Cleaning, the likelihood is reduced to very unlikely. Experience with tanks 18, 19, 5, 6, 12 and 16 demonstrate cleaning is possible.
Residual Consequence:	Significant	**Basis:** Although more likely in the near-term, the worst case impact would be realizing this risk on one of the final tanks to be cleaned. Insufficient waste removal will require further development and testing of more sophisticated cleaning technology and is assumed to delay the overall program by 1 year (assuming new technology is identified after submission of closure documentation). The implementation cost could be up to $20M for evaluation, development and deployment of the improved cleaning technology. This consequence is anticipated to lessen as successes are achieved and cleaning technology matures. An impact at the end of the program would be limited to the closure and waste processing activities necessary for the cleaning and closure of one tank, therefore the cost would be up to $50M (cost to send waste to offsite disposal or utilize a small melter to stabilize the waste). The end of the program is delayed by 1 year, but there are no additional facility costs as other facilities are allowed to shut down and decommission as scheduled.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 10,000	**Most Likely** 10,000	**Worst Case** 20,000
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

Worst Case: $20M for additional technology development (including cost for maintaining tanks).

Most Likely Case: $10M for technology improvement (including cost for maintaining tanks).

Best Case: New technology is available "off the shelf" (including cost for maintaining tanks).

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 50,000	**Most Likely** 50,000	**Worst Case** 50,000
Residual Schedule Impact :	3 Mths	6 Mths	1Yr

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: One year delay while additional supplemental technology is developed and deployed and a $50M cost to send waste to offsite disposal or utilize a small melter to stabilize the waste. The end of the program is delayed by 1 year, but there are no additional facility costs as other facilities are allowed to shut down and decommission as scheduled.

Most Likely Case: 6 months delay while additional supplemental technology is developed and deployed and $50M cost to send waste to offsite disposal or utilize a small melter to stabilize the waste. The end of the program is delayed by 6 months, but there are no additional facility costs as other facilities are allowed to shut down and decommission as scheduled.

Best Case: Additional time needed (3 Mths) for cleaning (repeat processes) and $50M cost to send waste to offsite disposal or utilize a small melter to stabilize the waste. The end of the program is delayed by 3 months, but there are no additional facility costs as other facilities are allowed to shut down and decommission as scheduled.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 60,000	**Most Likely** 60,000	**Worst Case** 70,000
Residual Schedule Impact :	3 Mths	6 Mths	1 Yr

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on total life cycle.

Risk Assumptions :

22. Types I, II, and IV tanks (Tanks 1–24):

-Waste Removal and Tank Removal from Service commitments are per the FFA

- Types I, II, and IV tanks (including Tanks 4, 7, 8, 11, and 21 through 24) may be used to optimize output of the Plan.

23. Type III and IIIA (Tanks 25–51):

-While the Type III and IIIA tanks are not included in the FFA, commitment for completion of waste removal (bulk waste and heel) from all tanks is per the STP

-Tanks are not required to be isolated and grouted to meet the STP

Event Comments: Interface risk with PBS-SR-0030.

PBS SR-0014

Risk Assessment Form

ID Number: 175 **Revision:** 10 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Event Title: Canyon Waste Contains Rogue Constituents (DOE Risk)		
Type: Risk, External, Technical	**Category:** Project Integration / Interfaces	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 1.0	**Assessable Element Title:** Receive Liquid Radioactive Waste	
WBS Number: 01.90.02.01	**WBS Title:** F-H Tank Farm Facilities	
Responsible Org: SRR-ENG	**Contact:** John Contardi	**Date Identified:** 3/27/2007

Statement of Event: A maximum of 300,000 gallons of waste each year will be received from the Canyon for storage in the Tank Farm (currently Tank 39). The characterization of this waste is planned to be compatible with Tank Farm storage, concentration and processing by downstream facilities. A risk exists that a constituent of concern is identified during characterization of this waste stream. This constituent makes the waste stream unacceptable for receipt by the Tank Farms (e.g. incompatible with Tank Farm storage, concentration and processing by downstream facilities). Waste acceptance by the Tank Farms would not be allowed to continue until an alternate storage, concentration or processing strategy could be developed.

Likelihood:	Unlikely	**Basis:** Previously waste streams have been received from the Canyon that contain rogue constituents. However, the planned operations of H-Canyon do not indicate any great differences from the current flowsheet. Changes to these flowsheets (e.g. new missions, process upsets) could impact the ability to meet the Tank Farm WAC. Changes to these flowsheets based on new missions could require a change to the System Plan. It is assumed that while receipt and disposition of Canyon waste that contains German graphite reactor fuel is not a mission change, the flowsheet changes could impact storage and processing by the HLW system. Regular interface meetings are continuing to be held and evaluation of new waste streams performed in compliance with procedures.
Consequence / Benefit:	Significant	**Basis:** The worst case would be that after all corrective action by H-Canyon the WAC cannot be met and a flowsheet would have to be developed to allow processing of the rogue constituent and still allow sludge processing. Tank space is used up until processing can start. A sludge batch could be jeopardized. The impact to the program would be a delay in sludge processing of up to 1 year and an additional cost of $50M for processing modifications. A delay in sludge processing for 1 year would halt SWPF operations for 1 year, resulting in a 1 year impact to the Program.
Most Significant Cost Impact ($k): 700,000		**Most Significant Schedule Impact :** 1 Yr
Level:	**Moderate**	**Event Trigger:** Risk open when receipt of Canyon Waste begins (currently open). Close - End of Canyon processing activities.
Handling Strategy:	Mitigate	**Description:** As part of ongoing program activities a system impact analysis methodically examines the potential impacts of all waste received to downstream processing facilities. New missions within the Canyon creating new waste streams would result in the need to revise contractor agreements with DOE.
Handling Strategy Action Items:		
HS Implementation Cost ($K):	0	**Basis:** Planning and strategy (including system impact analysis) for tank selection is within PBS-SR-0014 baseline. The cost of any additional characterization performed by the Canyon Facility will be funded by PBS-SR-0012/11.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: Canyon facility could rigorously examine their waste stream characterizations, prior to processing and producing waste for transfer to the Tank Farm and by identifying full characterization of their waste stream and testing for downstream processing (up to real waste testing) could identify this risk before material is received in the Tank Farms.

PBS SR-0014

Risk Assessment Form

ID Number: 175 **Revision:** 10 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Statement of Residual Risk: System impact analysis can still identify a potential impact which would necessitate a change in Contractor agreements (FSAs, Contract Mod etc.)

Residual Likelihood:	Very Unlikely	**Basis:** System impact analysis will identify the potential impacts of all waste received to downstream processing facilities and plan accordingly.
Residual Consequence:	Negligible	**Basis:** A rogue constituent is identified and a processing strategy will have to be developed and deployed at the Tank Farm before tank can be processed. $50M cost impact for processing modifications. Impact to Program is minimized as system impact analysis allows upfront planning to be performed.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 10,000	**Worst Case** 50,000
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

Worst Case: A rogue constituent is identified that can impact processing. Processing strategy will have to be developed and deployed at the Tank Farm before tank can be processed. $50M cost impact for processing modifications. As impact analysis identifies this upfront, some relief on perturbations to planning can be realized.

Most Likely Case: Rogue constituents are identified and a combination of process adjustments can be made at the H-Canyon and Tank Farms to resolve the problem. $10M cost impact for processing modifications.

Best Case: Rogue constituents are identified and process adjustments can be made at the H-Canyon to resolve the problem without additional cost impact.

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 54,000	**Worst Case** 108,000
Residual Schedule Impact :	0	1 Mth	2 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: 2 months delay to allow for planning and tank re-sequencing.

Most Likely Case: 1 month delay to allow for planning and tank re-sequencing.modifications.

Best Case: No impact.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 64,000	**Worst Case** 158,000
Residual Schedule Impact :	0	1 Mth	2 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on total life cycle.

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments: This is an interfacing risk with H-Canyon (PBS-SR-0011/12). PBS-SR-0014 recommends joint approval of projected missions, prior to acceptance by Canyon.

PBS SR-0014

Risk Assessment Form

ID Number: 176 **Revision:** 08 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Event Title: Volume of Canyon Waste is Greater Than Planned (DOE Risk)			
Type: Risk, External, Programmatic	**Category:** Project Integration / Interfaces	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 1.0	**Assessable Element Title:** Receive Liquid Radioactive Waste		
WBS Number: 01.90.02.01	**WBS Title:** F-H Tank Farm Facilities		
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 3/27/2007	
Statement of Event: After 2017, up to 300,000 gallons of waste each year is planned to be received from the Canyon for storage in the Tank Farm through 2025. A risk exists that additional output (longer duration or higher annual waste volume) is produced by the Canyon. Additional volume uses tank space and creates more material to be processed.			
Likelihood:	Very Unlikely	**Basis:** The volume of waste is a Memorandum of Understanding based, Functional Service Agreement (FSA), and a baseline change would be required. To date the average volume of waste received annually has been less than 300,000 gallons.	
Consequence / Benefit:	Marginal	**Basis:** Assuming an additional volume of up to 300,000 gallons between 2017 and 2025. Sludge batch processing would be impacted by having to evaporate this volume in lieu of decants. This would impact the program by four months.	
Most Significant Cost Impact ($k): 217,000		**Most Significant Schedule Impact :** 4 Mths	
Level:	**Low**	**Event Trigger:** Open - Currently open. Close - End of Canyon processing activities.	
Handling Strategy:	Avoid	**Description:** The volumes of waste to be received from the Canyon is a Memorandum of Understanding based (FSA) and a baseline change would be required if they were to change.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

PBS SR-0014 **Risk Assessment Form**

ID Number: 176 **Revision:** 08 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Statement of Residual Risk: This risk has been avoided.

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

30. Sufficient tank space volume is available to support the projected receipt of HLW into Tank 39 from H-Canyon operations through FY25. LLW waste, mainly from the General Purpose (GP) Evaporator, dispositioned in SPF are received into Tank 50 and direct discards of Pu and neptunium materials to the DWPF feed system are received into Tank 40, or Tank 51.

Event Comments: This is an interfacing risk with H-Canyon (PBS-SR-0011/12).

PBS SR-0014

Risk Assessment Form

ID Number: 182 **Revision:** 09 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Radioactive Release From Tank Farm			
Type: Risk, Internal, Programmatic	**Category:** Safety	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-OPS	**Contact:** Mike Borders	**Date Identified:** 4/11/2007	
Statement of Event: Safety controls are designed to protect the public, environment and worker. A risk exists that a significant release of airborne or liquid radioactivity occurs within the facility and operations are impacted by the cleanup and recovery activities.			
Likelihood:	Unlikely	**Basis:** Safety controls inherently drive down the likelihood of this event in protecting the Public, environment and worker.	
Consequence / Benefit:	Marginal	**Basis:** Public, environment and workers remain protected by the safety controls, however in the worst case a portion of the Tank Farm may be contaminated. The cost of decontamination ($5M) and impact to operations (schedule delay of 3 months) is realized.	
Most Significant Cost Impact ($k): 168,000		**Most Significant Schedule Impact :** 3 Mths	
Level:	**Low**	**Event Trigger:** Currently open; Close - upon completion of waste processing.	
Handling Strategy:	Accept	**Description:** This risk is accepted based on the low probability and the current safety controls and operational controls e.g. ALARA, maintenance and operational procedures.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

PBS SR-0014 **Risk Assessment Form**

ID Number: 182 **Revision:** 09 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: The residual risk remains the same i.e. a radioactive release may occur.

Residual Likelihood:	Unlikely	**Basis:** Likelihood remains unlikely.
Residual Consequence:	Marginal	**Basis:** Public, environment and workers remain protected by the safety controls, however in the worst case a portion of the Tank Farm may be contaminated. The cost of decontamination ($5M) and impact to operations (schedule delay of 3 months) is realized.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 1,000	**Most Likely** 2,000	**Worst Case** 5,000
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

Worst Case: Cost of decontamination ($5M).

Most Likely Case: Cost of some decontamination ($2M).

Best Case: Cost of minimal decontamination ($1M)

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 108,000	**Worst Case** 163,000
Residual Schedule Impact :	1 Mth	2 Mths	3 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: Three months schedule impact while decontamination activities are being performed.

Most Likely Case: Two months schedule impact while decontamination activities are being performed.

Best Case: One month schedule impact while decontamination activities are being performed.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 55,000	**Most Likely** 110,000	**Worst Case** 168,000
Residual Schedule Impact :	1 Mth	2 Mths	3 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on total life cycle.

Risk Assumptions :

Event Comments: The event of radioactive release from the Tank Farms is considered to be more credible than a release from another operating facility, therefore this risk will envelope the other less credible events.

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Risk Assessment Form

ID Number: 197 **Revision:** 08 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: DWPF Transfer Line Failure			
Type: Risk, Internal, Technical	**Category:** Process Performance - Equip./Infrastr.Failures	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 4.2	**Assessable Element Title:** Sludge Processing		
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations		
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 4/24/2007	
Statement of Event: DWPF transfer lines will be used for the next 22 years. No spare line is available. This risk involves the failure of one of the lines (core or jacket). This would result in DWPF downtime until a repair or alternate path is provided.			
Likelihood:	Very Unlikely	**Basis:** DWPF transfer lines were the most recently constructed at SRS and have cathodic protection. Where these transfer lines have been modified, they have always been found to be in good condition. The SE from both MCU and SWPF will use a DWPF transfer line.	
Consequence / Benefit:	Significant	**Basis:** The worst case would require a new transfer line to be constructed. This would be an impact to processing of I year and a cost of $25M (2500 feet @ $10K per foot).	
Most Significant Cost Impact ($k): 675,000		**Most Significant Schedule Impact :** 1 Yr	
Level:	**Low**	**Event Trigger:** Currently open; Close - upon completion of waste processing.	
Handling Strategy:	Accept	**Description:** 20 years of operations have been performed without any indication of line degradation. Programs are currently in place to perform inspections and maintenance.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 197 **Revision:** 08 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: Transfer line failure may still occur

Residual Likelihood:	Very Unlikely	**Basis:** Likelihood remains very unlikely.
Residual Consequence:	Significant	**Basis:** Transfer line requires repair. Near-term cost of $25M and outyear schedule delay of one year.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 1,000	**Most Likely** 5,000	**Worst Case** 25,000
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:
Worst case: 2500 ft of transfer line will have to be replaced (cost of line $25M)
Most Likely Case: $5M to repair a portion of the line.
Best Case: $1M to repair a portion of the line.

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 163,000	**Worst Case** 650,000
Residual Schedule Impact :	1 Mth	3 Mths	1 Yr

Basis of OUT YEAR Cost and Schedule Impacts:
Worst case: 2500 ft of transfer line will have to be replaced (1 yr delay)
Most Likely Case: 3 months to repair a portion of the line.
Best Case: 1 month to repair a portion of the line.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 55,000	**Most Likely** 168,000	**Worst Case** 675,000
Residual Schedule Impact :	1 Mth	3 Mths	1 Yr

Basis of LIFE CYCLE Cost and Schedule Impacts:
Residual impact based on total life cycle.

Risk Assumptions :
DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments: This is an interface risk with SWPF for the first year of operations.

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Risk Assessment Form

ID Number: 204 **Revision:** 08 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Interarea Transfer Line Failure			
Type: Risk, Internal, Technical	**Category:** Process Performance - Equip./Infrastr.Failures	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-OPS	**Contact:** Mike Borders	**Date Identified:** 5/9/2007	
Statement of Event: Transfer Lines are used to move waste between Tank Farms. The transfer lines were constructed in the early years of SRS (1950s). A risk exists that a transfer line failure occurs while transferring waste. Failure of a transfer line would shut down the transfer and impact processes that relied upon the transfer.			
Likelihood:	Very Likely	**Basis:** Transfer lines are designed with stainless steel core pipes and carbon steel jackets to reduce the impact of a failed core pipe. However these lines do not have cathodic protection and will be beyond their design life by the completion of this PBS (2040). Although the core pipe and the jacket pass periodic pressure tests to prevent the initiation of a transfer in a non-leak tight path, the failure mode would probably be sudden and without prior indication.	
Consequence / Benefit:	Significant	**Basis:** Worst case would be an Interarea Transfer Line failure. The inter-area transfer path has two transfer lines. One is used for the transfer while the other is used to assist with venting and flushing (when flow is in the other direction, the functions are reversed). These lines are encased in concrete which may limit the release, however, the leak may not be immediately detectable and a significant section of the line (including leak detection) would remain inoperable. The second line would have to be converted for use as a multi-directional primary transfer line which would require modifications to allow flushing and venting and new jumper fabrication and installation to establish a transfer path. Estimated cost impact would be $20M with a delay to the program of 1 year.	
Most Significant Cost Impact ($k): 670,000		**Most Significant Schedule Impact :** 1 Yr	
Level:	**High**	**Event Trigger:** Currently open; Close - upon completion of FTF waste processing.	
Handling Strategy:	Accept	**Description:** This risk is accepted based on performing system health reviews and leak detection testing.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** No additional cost.	
HS Implementation Schedule:	0	**Basis:** No impact to schedule.	
Other Handling Strategies: Investigate the feasibility of installing cathodic protection on the IAL. Convert inter-area transfer line to multi-directional flow. (see also risk 257)			

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Risk Assessment Form

ID Number: 204 **Revision:** 08 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: A risk remains that a transfer line failure occurs while transferring waste. Failure of a transfer line would shut down the transfer and impact processes that relied upon the transfer.

Residual Likelihood:	Very Likely	**Basis:** Transfer lines are designed with stainless steel core pipes and carbon steel jackets to reduce the impact of a failed core pipe. However these lines do not have cathodic protection and will be beyond their design life by the completion of this PBS (2040). Although the core pipe and the jacket pass periodic pressure tests to prevent the initiation of a transfer in a non-leak tight path, the failure mode would probably be sudden and without prior indication.
Residual Consequence:	Significant	**Basis:** Worst case would be an Interarea Transfer Line failure. The inter-area transfer path has two transfer lines. One is used for the transfer while the other is used to assist with venting and flushing (when flow is in the other direction, the functions are reversed). These lines are encased in concrete which may limit the release, however, the leak may not be immediately detectable and a significant section of the line (including leak detection) would remain inoperable. The second line would have to be converted for use as a multi-directional primary transfer line which would require modifications to allow flushing and venting and new jumper fabrication and installation to establish a transfer path. Estimated cost impact would be $20M with a delay to the program of 1 year.
Residual Risk Level:	**High**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	2,000	10,000	20,000
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:
Worst Case: $20M to convert secondary line to a primary transfer path.
Most Likely Case: $10M to convert secondary line to a primary transfer path
Best Case: $2M to repair leak.

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	163,000	325,000	650,000
Residual Schedule Impact :	3 Mths	6 Mths	1 Yr

Basis of OUT YEAR Cost and Schedule Impacts:
Worst Case: 1 year delay to convert secondary line to a primary transfer path.
Most Likely Case: 6 Months delay to convert secondary line to a primary transfer path.
Best Case: 3 Months delay to convert secondary line to a primary transfer path.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	165,000	335,000	670,000
Residual Schedule Impact :	3 Mths	6 Mths	1 Yr

Basis of LIFE CYCLE Cost and Schedule Impacts:
Residual impact based on total life cycle.

Risk Assumptions : 31. Tank Farm feed preparation infrastructure modifications required to support SWPF processing rates including:

-H-Tank Farm Blend tanks readiness for salt solution preparation
-F-Tank Farm Blend tanks readiness for salt solution preparation
-Tank 49 readiness as SWPF feed tank
-Mixing capabilities
-Enhanced transfer capabilities
-Transfer routes provided to feed tank.

Event Comments:

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Risk Assessment Form

ID Number: 205 **Revision:** 09 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Event Title: SWPF Not Available When Planned (DOE Risk)			
Type: Risk, External, Programmatic	**Category:** Project Integration / Interfaces	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1.2	**Assessable Element Title:** SWPF Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: DOE-SR	**Contact:** Pam Marks	**Date Identified:** 5/14/2007	
Statement of Event: The System Plan (Revision 20) identifies SWPF as beginning operation in December, 2018. A risk exists that the project may encounter delays and be unavailable for operation as planned.			
Likelihood:	Likely	**Basis:** The System Plan (Revision 20) startup date is December, 2018. Based on experience with unique facility projects at SRS to date, it is likely that this date will be missed. Currently within the SWPF Comtract Management Baseline (CMB) the late finish is February 2021.	
Consequence / Benefit:	Significant	**Basis:** The worst case, based on late finish could be up to a 26 month delay. This would be a day for day slip in the Program after decoupling ARP/MCU from processing. However assuming ARP/MCU would not be disconnected if SWPF startup slippage was being realized, ARP/MCU will continue processing for 26 months (19.5Mgals [lost SWPF processing] - 3.25Mgals [gained ARP/MCU production] = total volume of lost production of 16.25Mgals) resulting in a equivalent 22 month Program delay.	
Most Significant Cost Impact ($k): 1,191,000		**Most Significant Schedule Impact :** 22 Mths	
Level:	**Moderate**	**Event Trigger:** Open/Close on SWPF ready for operation.	
Handling Strategy:	Mitigate	**Description:** The management of the EPC contract is being performed by DOE-SR and handling of risks that may challenge the startup date of SWPF is the responsibility of DOE-SR. The DOE Federal Project Director will continue to monitor EPC contractor performance against the baseline schedule. The EPC contractor has developed a risk management plan for the SWPF project and is currently implementing the plan to handle these risks. Contract mechanism has been modified to incentivize construction complete (Milestone of December 2016 has been incentivized to an early completion in April 2016) and also to share schedule and cost risk with the EPC. Additional risk handling strategies are directed at maintaining the program completion milestones by extending operation of ARP/MCU through or beyond 2020.	

Handling Strategy Action Items:

205.1 Investigate regulatory and technical issues involved with extending ARP/MCU to 2020 or beyond., Brent Gifford

205.2 Pursue and resolve SCDHEC regulatory issues to ensure operations of ARP/MCU are permitted through 2020 or beyond., Keith Liner

205.3 Pursue and resolve technical issues (including any transfer line issues) to ensure operations of ARP/MCU through February 2021., Brent Gifford

205.4 Pursue and resolve WD and SCDHEC inventory commitments (handling curies not going through MCU e.g.filter cleaning) and regulatory issues to ensure operations of ARP/MCU are permitted through February 2021., Steve Thomas

205.5 Prepare project BCP for ARP/MCU operations (post Dec 2018) and incorporate into baseline for execution., Keith Harp

HS Implementation Cost ($K):	0	**Basis:** No additional cost.
HS Implementation Schedule:	0	**Basis:** Implementation will be performed in accordance with SWPF Project Schedule and the System Plan.
Other Handling Strategies: None		

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Risk Assessment Form

ID Number: 205 **Revision:** 09 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Statement of Residual Risk: A risk exists that the project may encounter delays and be unavailable for operation as planned.

Residual Likelihood:	Likely	**Basis:** The likelihood has been reduced yet still remains likely as based on experience with unique facility projects at SRS to date, it is likely that this date will be missed.
Residual Consequence:	Significant	**Basis:** The worst case, based on late finish could be up to a 26 month delay. This would be a day for day slip in the Program after decoupling ARP/MCU from processing. However assuming ARP/MCU would not be disconnected if SWPF startup slippage was being realized, ARP/MCU will continue processing for 26 months (19.5Mgals [lost SWPF processing] - 3.25Mgals [gained ARP/MCU production] = total volume of lost production of 16.25Mgals) resulting in a equivalent 22 month Program delay.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 271,000	**Most Likely** 596,000	**Worst Case** 1,191,000	Worst Case: 22 month program delay (project is delayed by 26 Mths). Most Likely Case: 11 month Program delay (project is delayed by 13 months). Best Case: 5 month Program delay (project is delayed by 6 months).
Residual Schedule Impact :	5 Mths	11 Mths	22 Mths	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 271,000	**Most Likely** 596,000	**Worst Case** 1,191,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	5 Mths	11 Mths	22 Mths	

Risk Assumptions :

3. The Salt Waste Processing Facility (SWPF) becomes operational December 3, 2018.

-Required Tank Farms, DWPF, and SPF modifications (e.g., Salt Disposition integration [SDI]) for SWPF, through Readiness Assessment (RA), will be complete two months prior to the initiation of the SWPF Operational Readiness Review (ORR)

Event Comments: Realizing this risk results in futher missing FFA dates for tank closure.

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Risk Assessment Form

ID Number: 209 **Revision:** 07 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Impacts of NRC Monitoring of 3116 Implementation for Salt Processing (DOE Risk)		
Type: Risk, External, Technical	**Category:** Regulatory and Environmental	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: SRR-WD	**Contact:** Steve Thomas	**Date Identified:** 5/17/2007

Statement of Event: The NRC has provided the DOE with their 3116 Monitoring Plan for the Salt Waste Disposal 3116 WD. It is assumed that NRC Monitoring open issues, activities and recommendations can be closed without any impact to the overall Program schedule. A risk exists that during the monitoring process, it becomes evident to DOE and SRR that closure of the open issues, activities or recommendations requires additional R&D activities, hardware, process modifications, and/or process hold points, such that processing is required to cease.

Likelihood:	Very Unlikely	**Basis:** Reviews of the NRC Monitoring Plan and Annual Reports, and experience to date, indicate that there will be an additional cost associated with closure of open issues, activities and recommendations and a potential for Program delays. Although additional costs are very likely, an impact to processing (i.e. cessation of SPF activities) is considered very unlikely. New information or challenges to an existing assumption used in the PA are handled using the UWMQ process. A type IV letter from NRC has been received by DOE regarding Saltstone performance objectives and DOE is working closely with NRC on a resolution.
Consequence / Benefit:	Marginal	**Basis:** Additional cost to projects to perform R&D, install hardware, perform sampling, etc., delays to processes due to additional sampling, testing and validation activities. (6 months Program delay [in the event of SPF halting e.g. Type III letter], additional cost $10M).

Most Significant Cost Impact ($k): 335,000 **Most Significant Schedule Impact :** 6 Mths

Level:	**Low**	**Event Trigger:** Open - Currently open; Close - upon completion of salt waste processing.
Handling Strategy:	Mitigate	**Description:** Strategies to close existing NRC Monitoring open issues, activities and recommendations with innovative application of existing programs, processes and resources and by minimizing modifications to projects and Program delays have been developed. Currently, as part of the Program, R&D and facility activities are being implemented as early as possible to address existing open issues, activities and recommendations and close communications are being maintained during monitoring to proactively provide information and avoid delays to the Program. The SDF PA has been revised and implemented. Additional information is being provided to support closure of NRC open issues, activities and recommendations. Strategies to close any new NRC monitoring issues or recommendations that arise will be generated and reviewed with the NRC. Complete an SDF SA to address NRC questions and Type IV letter. Develop a crosswalk of NRC concerns versus PA maintenance program and the FY2013 SDF SA. R&D is being performed to provide an empirical basis for the FY14 SDF SA.

Handling Strategy Action Items:

209.4 Perform R&D to provide an empirical basis for the FY14 SDF SA., Steven Thomas

HS Implementation Cost ($K):	0	**Basis:** Cost of evaluation and implementing program, testing, performing minor process modifications and executing program and procedural changes is included in the baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: Perform investigations into the fundamental mechanisms of cementitious degradation with lab and field tests and develop properties to be used in design and modeling; Evaluate the impact of key variables on saltstone and develop refined models to optimize the saltstone process (To complete these activities would require an additional $5M); Review the use of subsurface barriers to slow down travel time to point of assessment.

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Risk Assessment Form

ID Number: 209 **Revision:** 07 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: Even with a tailored strategy, early implementation and SDF PA revision and supporting R&D, a risk remains that some existing NRC issues, activities or recommendations are not closed in a timely manner and impact the Program or new items arise that impact the Program.

Residual Likelihood:	Very Unlikely	**Basis:** Likelihood of event has been reduced by the tailoring of requirements, however it remains very unlikely.
Residual Consequence:	Marginal	**Basis:** Some emergent issues, activities or recommendations are not able to be closed using existing strategies and require additional near-term cost of $10M for data collection. The additional data being developed as part of pro-active mitigation in anticipation of emergent issues is not condsidered sufficient to avoid a cessation of SPF processing. SPF operations will be halted for up to 6 months.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 1,000	**Most Likely** 5,000	**Worst Case** 10,000	Worst Case: Some emergent issues, activities or recommendations are not able to be closed using existing strategies and require additional near-term cost of $10M for data collection.
Residual Schedule Impact :	0	0	0	Most Likely Case: Some emergent issues, activities or recommendations are not able to be closed using existing strategies and require additional near-term cost of $5M for data collection. Best Case: Some emergent issues, activities or recommendations are not able to be closed using existing strategies and require additional near-term cost of $1M for data collection.

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 325,000	Worst Case: Issues result in a six month cessation of processing to resolve. Most Likely and Best Case: SPF Processing will not be halted.
Residual Schedule Impact :	0	0	6 Mths	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 1,000	**Most Likely** 5,000	**Worst Case** 335,000	Residual impact based on total life cycle.
Residual Schedule Impact :	0	0	6 Mths	

Risk Assumptions :

18. During SWPF operation:

-SPF and SDF will support SWPF processing rates

-Additional operational time (i.e., multiple shifts, additional operating days each week, etc.) and adequate SDU receipt space to match production streams from SWPF are planned

-Modifications will provide sufficient contingency storage capacity to minimize impacts to SWPF or ETF due to SPF or SDF outages.

Event Comments: This is an interface risk with the DOE-SR SWPF Line Item Project.

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Risk Assessment Form

ID Number: 213 **Revision:** 10 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: NRC Activities for Monitoring of Closure Process Not Well Defined (DOE Risk)			
Type: Risk, External, Technical	**Category:** Regulatory and Environmental	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 6.0	**Assessable Element Title:** Closure (Tanks, Evap. & Ancil. Equip) Including Heel Removal		
WBS Number: 01.90.01	**WBS Title:** Waste Removal and Tank Closure		
Responsible Org: SRR-WD	**Contact:** Larry Romanowski	**Date Identified:** 5/29/2007	
Statement of Event: The NRC has provided DOE with the 3116 monitoring plan for HTF and FTF closure including NRC activities for monitoring of closure activities (tanks and ancillary equipment and facilities). A risk exists that once defined by the NRC, the implementation of NRC monitoring of closure activities will impact the Program.			
Likelihood:	Very Unlikely	**Basis:** NRC has issued their FTF and HTF monitoring plan and a review of these documents have not identified any impacts to the Program. This is the initial implementation of 3116 on tank closure at SRS, therefore, uncertainties are involved, however it is considered very unlikely that there will be a Program impact.	
Consequence / Benefit:	Negligible	**Basis:** Physical changes to systems to allow the acquisition of data (cost of modification and delay to closure) is considered minimal. These could involve such things as additional monitoring and R&D. Estimate $20M of additional monitoring costs (R&D and personnel to perform monitoring).	
Most Significant Cost Impact ($k): 20,000	**Most Significant Schedule Impact :** 0		
Level:	**Low**	**Event Trigger:** Currently open; Close - Completion of PBS-SR-0014.	
Handling Strategy:	Accept	**Description:** This risk is accepted as current process maximizes communication between NRC, DOE and SRR. No additional handling strategies are available and the risk exposure is negligible.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 213 **Revision:** 10 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: NRC monitoring of closure activities may still impact the Program.

Residual Likelihood:	Very Unlikely	**Basis:** The likelihood has not been reduced as this risk is accepted.
Residual Consequence:	Negligible	**Basis:** Near-term cost of additional monitoring and R&D (model support) ($5M). Outyear cost of $15M.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 2,000	**Most Likely** 4,000	**Worst Case** 5,000
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:
Worst Case: Cost of additional monitoring and R&D ($5M).
Most Likely Case: Cost of some additional monitoring and R&D ($4M).
Best Case: Cost of a minimal amount of additional monitoring and R&D ($2M).

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 3,000	**Most Likely** 6,000	**Worst Case** 15,000
Residual Schedule Impact :	0	0	0

Basis of OUT YEAR Cost and Schedule Impacts:
Worst Case: Cost of additional monitoring and R&D ($15M).
Most Likely Case: Cost of some additional monitoring and R&D ($6M).
Best Case: Cost of a minimal amount of additional monitoring and R&D ($3M).

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 5,000	**Most Likely** 10,000	**Worst Case** 20,000
Residual Schedule Impact :	0	0	0

Basis of LIFE CYCLE Cost and Schedule Impacts:
Residual impact based on total life cycle.

Risk Assumptions :

27. A 30-month operational closure and stabilization process is assumed

-Drying & Sampling (6 months on critical path): including Tank Drying, Sample Prep Documents, Volume Determination Cessation Presentation and Sampling

-Sample Analysis (7 months on critical path): including Lab Analysis and Sample Analysis Report (SAR)

-Closure Documentation (14 months on critical path): including DQA, Inventory Determination, Special Analysis, MEP, Class C Calculation, Closure Module, and Tier 2

-Grouting (3 months on critical path)

Event Comments:

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Risk Assessment Form

ID Number: 214 **Revision:** 09 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Compliance Assessment Data Conflicts With Assumptions Upon Which 3116 WD is Based			
Type: Risk, External, Technical	**Category:** Regulatory and Environmental	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-WD	**Contact:** Steve Thomas	**Date Identified:** 5/29/2007	
Statement of Event: Data gathering and evaluation of data to ensure ongoing compliance with 3116 WD assumptions is being performed for Salt Waste Disposal, and both FTF and HTF closure activities. A risk exists that data will be found to invalidate assumptions used as a basis for the applicable 3116 WD. Processing, disposal and/or closure activities will be halted until issues are resolved.			
Likelihood:	Unlikely	**Basis:** The 3116 WDs are developed and reviewed by many independent technical entities. Questions are raised and resolved as part of the review process. It is unlikely that an issue will be encountered between the data gathered during implementation and the assumptions upon which the 3116 WD was based.	
Consequence / Benefit:	Negligible	**Basis:** It is not considered a credible worst case that a new wasteform would be required. The worst case anticipated would require the conclusions and technical basis for the 3116 WD to be demonstrated to remain valid. It is considered non-credible that an issue of such a magnitude would be found that would require a cessation of processing. There will be an incurred cost to re-visit 3116 WD technical basis of up to $5M and potential modification to processing or closure design activities incurring up to an additional $1M (e.g. changing cap design, minor facility mods, etc.).	
Most Significant Cost Impact ($k): 6,000		**Most Significant Schedule Impact :** 0	
Level:	**Low**	**Event Trigger:** Currently open; Close - upon completion of program.	
Handling Strategy:	Accept	**Description:** This risk is accepted based on the established process of review and discussion of assumptions by all parties. This process ensures that assumptions are clearly understood.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: Perform investigations into the fundamental mechanisms of cementitious degradation with lab and field tests and develop properties to be used in design and modeling. Evaluate the impact of key variables on saltstone and develop refined models to optimize the saltstone process. Review the use of subsurface barriers to slow down travel time to point of assessment.			

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Risk Assessment Form

ID Number: 214 **Revision:** 09 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: A risk remains that a delay during which the technical basis for the 3116 WD is re-visited and revised may still be realized.

Residual Likelihood:	Unlikely	**Basis:** It remains unlikely that an issue will be encountered between the data gathered during implementation and the assumptions upon which the 3116 WD was based.
Residual Consequence:	Negligible	**Basis:** It is not considered a credible worst case that a new wasteform would be required. The worst case anticipated would require the conclusions and technical basis for the 3116 WD to be demonstrated to remain valid. It is considered non-credible that an issue of such a magnitude would be found that would require a cessation of processing. There will be an incurred cost to re-visit 3116 WD technical basis of up to $5M and potential modification to processing or closure design activities incurring up to an additional $1M (e.g. changing cap design, minor facility mods, etc.).
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 6,000	**Most Likely** 6,000	**Worst Case** 6,000	All Cases: There will be an incurred cost to re-visit 3116 WD technical basis of up to $5M and potential modification to processing or closure design activities incurring up to an additional $1M (e.g. changing cap design, minor facility mods, etc.).
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 6,000	**Most Likely** 6,000	**Worst Case** 6,000	Residual impact based on risk having near-term consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

27. A 30-month operational closure and stabilization process is assumed

-Drying & Sampling (6 months on critical path): including Tank Drying, Sample Prep Documents, Volume Determination Cessation Presentation and Sampling

-Sample Analysis (7 months on critical path): including Lab Analysis and Sample Analysis Report (SAR)

-Closure Documentation (14 months on critical path): including DQA, Inventory Determination, Special Analysis, MEP, Class C Calculation, Closure Module, and Tier 2

-Grouting (3 months on critical path)

Event Comments: This is a potential cross-cutting risk with PBS-SR-00030/40 for construction of a different closure cap design.

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Risk Assessment Form

ID Number: 219 **Revision:** 10 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: DWPF Criticality Concerns During SWPF Processing and/or Sludge Batch Processing			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste		
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations		
Responsible Org: SRR-ENG	**Contact:** Thomas Huff	**Date Identified:** 5/31/2007	
Statement of Event: DWPF will process sludge and strip effluent and MST sludge solids from SWPF salt processing. A risk exists that the waste received from these sources will exceed the enrichment limits of DWPF. Waste cannot be processed by DWPF until acceptable criticality controls can be implemented.			
Likelihood:	Very Unlikely	**Basis:** To date, criticality limits have not been challenged, however there are waste tanks to be processed with a much higher fissile loading than previous DWPF campaigns have processed. The SDI criticality strategy evaluated DWPF criticality and determined the SWPF waste stream can be processed without any facility modifications. Enrichment limit has been revised and raised to 5%. SWPF WCP has a higher limit of 8% enrichment which could result in a higher enriched feed to DWPF. It is considered very unlikely that SWPF processing will exceed the current limit of 5% enrichment.	
Consequence / Benefit:	Negligible	**Basis:** The worst case would require physical modifications to the facility(s) to install a poison addition system. No delays are incurred to processing at DWPF as modifications will be performed within the Tank Farms. The cost of modifications to the Tank Farms would be up to $10M.	
Most Significant Cost Impact ($k): 10,000		**Most Significant Schedule Impact :** 0	
Level:	**Low**	**Event Trigger:** Currently Open; Close - Completion of DWPF processing.	
Handling Strategy:	Accept	**Description:** Accepted as 5% enrichment level has been established.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 219 **Revision:** 10 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: Even after the development of improved criticality controls that can allow a higher level of fissile material this risk may still be realized and a physical modification required to add a depletion or poison system.

Residual Likelihood:	Very Unlikely	**Basis:** The likelihood remains very unlikely.
Residual Consequence:	Negligible	**Basis:** The worst case would require physical modifications to the facility(s) to install a poison addition system. No delays are incurred to processing at DWPF as modifications will be performed within the Tank Farms. The cost of modifications to the Tank Farms would be up to $10M.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 10,000	Worst Case: An additional cost of $10M to design and install a depletion/poison system. Most Likely Case and Best Case: Other poisons are credited in the analysis of criticality, or a blending strategy employed, no depletion system is needed (perform an NCSE revision to credit other poisons).
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 10,000	Residual impact based on near term consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

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Risk Assessment Form

ID Number: 220 **Revision:** 08 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Event Title: Inaccuracies When Sampling for Grout Formulation in Tank 50		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 5.1	**Assessable Element Title:** Grout Encapsulation of Waste	
WBS Number: 01.90.03.01	**WBS Title:** Saltstone Operations	
Responsible Org: SRR-ENG	**Contact:** Eric Freed	**Date Identified:** 5/31/2007

Statement of Event: Tank 50 will receive waste from ETF, H-Canyon and MCU and SWPF. Sampling the contents of Tank 50 provides information to ascertain the appropriate grout formulation necessary to assure adequate grout production at SPF. As Tank 50 is a sample and send, i.e. different streams are being received in the tank at differing rates, a risk exists that any sample information or correlation data used to determine the physical properties of the grout formulation will be inaccurate. Grout may not behave as predicted and cause problems when processing. Also environmental permitting and PA may be challenged and DSA requirements may prove difficult to implement.

Likelihood:	Unlikely	**Basis:** Characterizing influents to Tank 50 and quarterly sampling and testing of Tank 50 material in conjunction with application of process knowledge ensures this is an unlikely event. A potential may exist for upset conditions in generating facilities.
Consequence / Benefit:	Significant	**Basis:** The grout formulation used could cause the system to repeatedly foul lines, rock up the process or make unacceptable product. Assuming the formulation causes the grout to setup in the line upon facility start-up due to formulation error, the pressure relief device would rupture, diverting material to the SHOC as the process is shut down. Without being able to completely de-inventory the hopper, mixer, and grout pump, the scope of recovery becomes a majority of the process room and grout line. If adequate spares are not available, delay could be up to 2 months and cost up to $2.5M (new mixer $1.5; new pump $200k; plus other miscellaneous replacement equipment). However, in the worst case, if in addition a permit or environmental problem were to be realized (permit violation due to unsatisfactory grout being placed in a vault) this could result in up to 1 year to resolve.

Most Significant Cost Impact ($k): 652,500 **Most Significant Schedule Impact :** 1 Yr

Level:	**Moderate**	**Event Trigger:** Currently Open; Close - completion of saltstone operations.
Handling Strategy:	Mitigate	**Description:** As part of the current program grout mixtures capable of producing acceptable grout that are tolerant to variations in waste feed chemistry are investigated and developed. Streams are baselined through the grout formulation and variability programs. Negative characteristics are identified early to allow chemistry correction in Tank 50 prior to reaching the bounding case of the grout formulation. Prior to SWPF being brought on line, sampling periodicity will be investigated to align with the increased amount of DSS being processed. Salt Batch planning is performed to predict Tank 50 chemistry for processing.

Handling Strategy Action Items:

220.1 Include Saltstone processability evaluation in the Salt Program macro batch qualification., Jason Vitali, Completed, 1/19/2016

220.2 Investigate and develop requirements for the periodicity of sampling during SWPF maximum throughput and document in Tank Farm Waste Compliance Plan., Carol Sherburne

HS Implementation Cost ($K):	0	**Basis:** This cost is within the current baseline for quarterly samples, however, upon evaluation of SWPF increased DSS production, if an increased sampling frequency is determined, it is not currently included.
HS Implementation Schedule:	0	**Basis:** Completed within System Plan schedule baseline.

Other Handling Strategies: None

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Risk Assessment Form

ID Number: 220 **Revision:** 08 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Statement of Residual Risk: Even after monitoring of SPF production parameters and developing salt macro batch sampling requirements, an unsuitable grout batch may be produced that impacts facility operations.

Residual Likelihood:	Very Unlikely	**Basis:** The trending of production parameters and refined sampling requirements reduce the likelihood of waste chemistry impacting grout production.
Residual Consequence:	Negligible	**Basis:** A rockup of the facility may still occur, however with the program controls in place, the production of unacceptable grout has been avoided.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Worst Case and Most likely Case: Equipment costs ($2,500K)
	0	2,500	2,500	Best Case: Operations are halted however, restart is possible and no equipment damage occurs.
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Worst Case and Most likely Case: 2 Months delay to Program.
	0	108,000	108,000	Best Case: Operations are halted however, restart is possible and no equipment damage occurs.
Residual Schedule Impact :	0	2 Mths	2 Mths	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Impact based on total life cycle consequences.
	0	110,500	110,500	
Residual Schedule Impact :	0	2 Mths	2 Mths	

Risk Assumptions :

18. During SWPF operation:

-SPF and SDF will support SWPF processing rates

-Additional operational time (i.e., multiple shifts, additional operating days each week, etc.) and adequate SDU receipt space to match production streams from SWPF are planned

-Modifications will provide sufficient contingency storage capacity to minimize impacts to SWPF or ETF due to SPF or SDF outages.

Event Comments: This risk addresses the physical properties of the grout as it relates to processing. Other issues with the final grout form properties are addressed under other risks.

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Risk Assessment Form

ID Number: 221 **Revision:** 08 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Salt Baseline Characterization Different Than Forecast			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 6/12/2007	
Statement of Event: The Waste Characterization System (WCS) and other data sources are used in planning the preparation of salt feed for salt processing. A risk exists that after preparation the characterization of the salt solution is not as predicted. As a result, a risk exists that extended processing is required.			

Likelihood:	Unlikely	**Basis:** Historically, WCS has focused on capturing the data relevant to concerns in storage and processing of tank waste and influent stream material. Data may not be accurate or available on other species that were not normally of interest yet could impact the salt processing plan, however based on the results of core sample analysis (Tank 25 and 28) to date, it is considered unlikely to create a problem. The potential for the salt dissolution to create an issue with the characterization may also exist and contribute to this event.
Consequence / Benefit:	Marginal	**Basis:** The worst case would be that the current plan to adjust the salt waste to achieve a sodium molarity compatible with SWPF is no longer the limiting factor for processing and another species such as potassium, aluminate, silicon, uranium etc., requires further adjustment of the waste to allow processing through SWPF. It is estimated that up to 5 Mgals additional volume of salt solution would have to be processed, causing delays to the program up to 6 months. Based on processing capacity of 9 Mgals/yr from SWPF).
Most Significant Cost Impact ($k): 325,000		**Most Significant Schedule Impact :** 6 Mths
Level:	**Low**	**Event Trigger:** Currently open; Close - completion of salt processing.
Handling Strategy:	Mitigate	**Description:** Currently, as part of the program, the salt processing strategy is adjusted as required to accommodate characterization results from salt dissolution campaigns.
Handling Strategy Action Items:		
HS Implementation Cost ($K):	0	**Basis:** Cost is within the current baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.
Other Handling Strategies: Evaluate the need for additional salt sampling and analysis; perform as deemed necessary to provide enhanced characterization data.		

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Risk Assessment Form

ID Number: 221 **Revision:** 08 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: The need for additional sampling and analyses will be fully evaluated and conducted as deemed necessary. Tank characterization could be significantly different than the characterization data from WCS and thus impacts processing.

Residual Likelihood:	Unlikely	**Basis:** The handling strategy reduces the likelihood of being unable to process salt feed by adjusting the salt processing strategy to accommodate the results of any additional sampling and characterization, however, it remains unlikely.
Residual Consequence:	Marginal	**Basis:** Processing impacts of up to 3 Mgals of additional salt waste resulting in up to 4 Months delay to the program.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 108,000	**Worst Case** 217,000	Worst Case: Processing impacts of up to 3 Mgals of additional salt waste resulting in up to 4 Months delay to the program. Most Likely Case: Processing impacts of up to 1.5 Mgals of additional salt waste resulting in up to 2 Mths delay to the program. Best Case: Characterization differs, but no impact to processing.
Residual Schedule Impact :	0	2 Mths	4 Mths	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 108,000	**Worst Case** 217,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	0	2 Mths	4 Mths	

Risk Assumptions :

Salt Processing and salt batch need dates are projected by the Salt Batch Plan.

Event Comments:

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Risk Assessment Form

ID Number: 251 **Revision:** 08 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Event Title: Aluminum Dissolution Impacts Saltstone Processing			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 5.1	**Assessable Element Title:** Grout Encapsulation of Waste		
WBS Number: 01.90.03.01	**WBS Title:** Saltstone Operations		
Responsible Org: SRR-ENG	**Contact:** Eric Freed	**Date Identified:** 6/3/2008	

Statement of Event: As part of the System Plan, aluminum dissolution will be performed to reduce sludge mass prior to vitrification. After being processed through SWPF, the leached aluminum will eventually be fed to SPF. A risk exists that this increased level of aluminum may adversely impact SPF process performance.

Likelihood:	Likely	**Basis:** Preliminary impact assessments (Ref: LWO-LWE-2008-00117) have identified potential problematic effects such as increase in set time, extended induction periods for heat evolution and overall heat of hydration increase. However beneficial effects of higher aluminum concentrations have been identified such as decreased Bingham Plastic yield stress and plastic viscosity, greater flowability of the grout and reduced excess gel times and bleed volume for SWPF-based mixes. Bearing in mind beneficial and negative impacts, it is considered likely that the throughput of SPF will be impacted.
Consequence / Benefit:	Significant	**Basis:** The worst case impact would be problematic effects such as increased heat of hydration, extended set time and extended heat evolution periods impacting the ability to pour grout in the cells at the planned rate. Throughput of the overall facility would be reduced, SPF would become a "choke-point" for SWPF DSS stream. Salt Batch Planning would require the identification of a feed to blend with the Salt Feed Batch to reduce the aluminum concentration. This would result in extending the duration of salt processing for the System Plan. The adjustment of feed to reduce the impacts could result in additional volume of feed if no suitable feed tank is available and adjustment is required. This could extend the length of the program up to 18 months due to additional feed requiring processing.

Most Significant Cost Impact ($k): 975,000		**Most Significant Schedule Impact :** 18 Mths
Level:	**Moderate**	**Event Trigger:** Currently open/Close on completion of SPF operations.
Handling Strategy:	Mitigate	**Description:** Investigate the trade-off between feed adjustment and modified grout placement strategies aimed at reducing the heat of hydration. Investigate modified grout formulations to identify the optimum feed to minimize this impact. Perform ongoing grout testing as part of the ongoing program and incorporate results into planning.

Handling Strategy Action Items:

251.1 Review testing performed to date and identify if any additional formulation testing is required to support raising SPF WAC., Jason Vitali

251.2 Perform additional testing and establish modified grout placement strategies as required., Jason Vitali

251.3 Revise SPF WAC for placement strategies and Aluminum requirements., Jason Vitali

HS Implementation Cost ($K):	0	**Basis:** The cost of these activities are within the current baseline.
HS Implementation Schedule:	0	**Basis:** No schedule impact

Other Handling Strategies: Introduce a unit operation to capture aluminum (e.g. lithium hydrotalcite precipitation).

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Risk Assessment Form

ID Number: 251 **Revision:** 08 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Statement of Residual Risk: Risk remains that increased levels of aluminum may adversely impact SPF process performance.

Residual Likelihood:	Unlikely	**Basis:** Likelihood has been reduced by implementing feed adjustment and grout placement strategies.
Residual Consequence:	Significant	**Basis:** The worst case impact would be problematic effects (increased heat of hydration, extended set time etc.), reducing overall facility throughput, additionally more salt solution would require processing due to adjustment of SWPF feed. Although less than the unmitigated impact this could be up to 1 year.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 163,000	**Most Likely** 325,000	**Worst Case** 650,000
Residual Schedule Impact :	3 Mths	6 Mths	1 yr

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: Placement issues and additional blending extend program by up to 1 year.

Most Likely Case: Placement issues and additional blending extend program by up to 6 Mths.

Best Case: Placement issues and additional blending extend program by up to 3 Mths.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 163,000	**Most Likely** 325,000	**Worst Case** 650,000
Residual Schedule Impact :	3 Mths	6 Mths	1 yr

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on risk having out-year consequences only.

Risk Assumptions :

18. During SWPF operation:

-SPF and SDF will support SWPF processing rates

-Additional operational time (i.e., multiple shifts, additional operating days each week, etc.) and adequate SDU receipt space to match production streams from SWPF are planned

-Modifications will provide sufficient contingency storage capacity to minimize impacts to SWPF or ETF due to SPF or SDF outages.

Event Comments:

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Risk Assessment Form

ID Number: 257 **Revision:** 08 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Inter-Area Transfer Line "Salts Out"			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-OPS	**Contact:** Mike Borders	**Date Identified:** 8/4/2008	
Statement of Event: Salt will be dissolved from F-Area Tanks and transferred to H-Area via the Inter-Area Transfer Line. A risk exists that during the transfer, an off-normal condition forces the shutdown of the transfer and the salt crystallizes in the transfer line (salts out) resulting in a plugged transfer line. Transfer cannot proceed until line is unplugged.			
Likelihood:	Very Likely	**Basis:** The specific gravity (SG) of the salt being transferred is high and will tend to crystallize out in the line if the temperature drops. The number of diversion boxes/pump pits make it more likely that a perturbation in the transfer route will force a temporary shutdown of the transfer.	
Consequence / Benefit:	Negligible	**Basis:** In the worst case, the transfer is shut down and the temperature of the surrounding pipe drops causing salt precipitation that plugs the line. The pluggage cannot be removed by restarting the process and multiple jumpers are required to be removed and the line segments cleaned. This will take up to 4 weeks. Over the period of F-tank Farm salt dissolution, multiple salt outs could occur (for estimating consequences, 2 occurrences are assumed). Depending on the sequencing of feed and the feed preparation, this could force a day for day slip with SWPF salt processing and hence the Program.	
Most Significant Cost Impact ($k): 100,000		**Most Significant Schedule Impact :** 8 Wks	
Level:	**Low**	**Event Trigger:** Currently Open / Closed upon completion of F-Area salt dissolution and transfer.	
Handling Strategy:	Mitigate	**Description:** A temp mod high point flushing capability has been developed. Inter-Area Dilution Facility in F-Area may be used to add water in FPT-1 during salt solution transfers to lower the SG.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** The cost of these activities are within the current baseline.	
HS Implementation Schedule:	0	**Basis:** No impact to the schedule baseline.	
Other Handling Strategies: Convert inter-area transfer line to multi-directional flow. (see also risk 204)			

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Risk Assessment Form

ID Number: 257 **Revision:** 08 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: The high point flush capability has been deployed and salt outs may be removed using these capabilities. Temperature is also evaluated prior to transfer. A risk remains that some salt out will still require up to two weeks to clean out if flushing from the high point is unsuccessful.

Residual Likelihood:	Very Unlikely	**Basis:** The likelihood of salt-outs has been reduced.
Residual Consequence:	Negligible	**Basis:** Same number of salt outs occur and are resolved by flushing from the high point (require 2 weeks to resolve).
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 50,000	**Worst Case** 50,000	Worst Case: Same number of salt outs occur and are resolved by flushing from the high point (require 2 weeks to resolve) Most Likely Case: Same as worst case. Best Case: Low SG operations can be performed.
Residual Schedule Impact :	0	4 Wks	4 Wks	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 50,000	**Worst Case** 50,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	0	4 Wks	4 Wks	

Risk Assumptions :

31. Tank Farm feed preparation infrastructure modifications required to support SWPF processing rates including:

-H-Tank Farm Blend tanks readiness for salt solution preparation

-F-Tank Farm Blend tanks readiness for salt solution preparation

-Tank 49 readiness as SWPF feed tank

-Mixing capabilities

-Enhanced transfer capabilities

-Transfer routes provided to feed tank.

Event Comments:

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Risk Assessment Form

ID Number: 264 **Revision:** 09 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: DWPF is Unable to Process SWPF Strip Effluent at Required Throughput Due to Boil off Capacity Limits		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste	
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations	
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 3/3/2009

Statement of Event: Strip effluent will be transferred from SWPF and received in DWPF SEFT. The strip effluent is transferred from the SEFT to the SRAT where it is mixed with sludge, chemically adjusted and volume reduced by boiling. Enhancements are planned to use both the SRAT and SME to increase the boil-off rate of the water. A risk exists that even with this improvement, the strip effluent to be processed requires a longer processing cycle than expected. This reduces the throughput of DWPF to a point that the facility can no longer process the strip effluent output from SWPF when it operates at the planned 9 Mgals/yr. Salt processing is forced to slow down.

Likelihood:	Very Unlikely	**Basis:** Other enhancements planned for DWPF will further improve the boil off capacity when used in conjunction with this enhancement (e.g. SEFT to SME, dry frit, alternate reductant, etc.)
Consequence / Benefit:	Severe (Critical)	**Basis:** The worst case would be that when SWPF begins operation at full capacity, strip effluent output cannot be processed at the required throughput by DWPF during 9 Mgals/yr nominal production at SWPF. This could limit SWPF throughput to 7 Mgals/yr. Over an operational life of 10 years (SWPF operating at 9 Mgals/yr from FY22), the extension to the Program would be to process an additional 20 Mgals at SWPF (7 Mgals/Yr). This would impact the Program by up to 34 Mths.

Most Significant Cost Impact ($k): 1,842,000 **Most Significant Schedule Impact :** 34 Mths

Level:	**Moderate**	**Event Trigger:** Open upon SWPF starting operation at full capacity; Close upon demonstrating boil off capacity is not an issue (e.g. after 1 year of 9Mgal/yr operation).
Handling Strategy:	Mitigate	**Description:** Process enhancements are designed to provide DWPF with the capacity to handle SWPF strip effluent to support planned SWPF 9 Mgal/yr with a reasonable margin to allow for model and flowsheet uncertainty. Ensure the facility systems are able to operate at full design capacity with full steam rate to vessels. Validate that the current modifications adequately support the System Plan requirements by performing COREsim modeling (detailed water balance).

Handling Strategy Action Items:

264.2 Implement the requirements of the DWPF Process improvement study., George Matis

HS Implementation Cost ($K):	0	**Basis:** No additional cost
HS Implementation Schedule:	0	**Basis:** Will not impact the current baseline schedule.

Other Handling Strategies: None

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Risk Assessment Form

ID Number: 264 **Revision:** 09 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: A risk remains that even with the identification and implementation of modifications to ensure systems can meet the design basis with full design basis steam supply to vessels, the facility cannot process SWPF strip effluent when it operates at the planned 9 Mgals/yr. Salt processing is forced to slow down.

Residual Likelihood:	Very Unlikely	**Basis:** The likelihood is reduced but remains very unlikely.
Residual Consequence:	Significant	**Basis:** The reduction in SWPF throughput is limited with the introduction of process improvements such that over an operational life of 10 years, the extension to the program would be reduced from to 18 Mths.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 325,000	**Most Likely** 650,000	**Worst Case** 975,000	Worst case: The reduction in SWPF throughput is limited with the introduction of process improvements such that over an operational life of 10 years, the extension to the program would be reduced from 34 to 18 Mths.
Residual Schedule Impact :	6 Mths	12 Mths	18 Mths	Most Likely Case: The reduction in SWPF throughput is limited with the introduction of process improvemnts such that over an operational life of 10 years, the extension to the program would be reduced to 12 Mths. Best case: The reduction in SWPF throughput is limited with the introduction of process improvemnts such that over an operational life of 10 years, the extension to the program would be reduced from to 6 Mths.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 325,000	**Most Likely** 650,000	**Worst Case** 975,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	6 Mths	12 Mths	18 Mths	

Risk Assumptions :

4. SWPF nominal capacity is:

-4.625 Mgal/yr for the first year of operation

-7.2 Mgal/yr for the next two years of operation

-An SWPF outage is assumed at an appropriate time afetr the SWPF first year of operation to perform next generation solvent implementation to increase facility capacity to 9.0 Mgal/yr

-Nominally SWPF will produce:

- For each gallon processed, ~1.28 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Note: When production exceeds 7.2Mgal/yr, SE will be limited to 576 kgal/yr

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

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Risk Assessment Form

ID Number: 267 **Revision:** 08 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Schedule For Complex Concurrent Activities Not Sustainable		
Type: Risk, Internal, Programmatic	**Category:** Project Integration / Interfaces	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 4/27/2009

Statement of Event: The LW System is complex and highly integrated. The implementation of projects/operations activities required for successful program completion (e.g., tank closures, etc.) often impacts on-going facility operations. Many of these are being installed in facility areas where active processing is underway. Outages must be meticulously planned and scheduled to maximize use of available resources (work planners, RadCon, construction, operations, procedure writers, etc.) while minimizing facility, operations activity or project downtime. A risk exists that these concurrent activities are not sustainable.

Likelihood:	Very Likely	**Basis:** Priority decisions are made every day in the facilities to best support programmatic commitments with available staffing and other resources. Multiple schedules are impacted by these priority decisions. System Plan Revision 20 increases the likelihood of this event, however, prior to SWPF operation a high degree of complexity will exist making this risk event very likely.
Consequence / Benefit:	Significant	**Basis:** Co-location issues for performing major project and facility upgrades in operating facilities could lead to an extension of program life by up to 1 year.

Most Significant Cost Impact ($k): 650,000 **Most Significant Schedule Impact :** 1 Yr

Level:	**High**	**Event Trigger:** Currently open; Close upon completion of waste processing.
Handling Strategy:	Mitigate	**Description:** Currently detailed integrated facility schedules are being maintained to coordinate planned activities and System Plan and changes to the System Plan are routinely communicated to Facility and Project Management. Facility and Project Managers are involved early in the project/operations activity development to understand project implementation impacts on on-going facility operations. Once understood, these impacts are accommodated and incorporated into the design, construction and turnover. Continuing to identify and resolve integration issues as any major assumptions change or as new issues arise. Working with internal and external stakeholders to communicate the System Plan. System Planning process now includes: Annual updates to the System Plan; Conducting thorough, integrated planning, prioritization and management of closure operations, with full consideration of physical, logistical and operational constraints; Analyzing and managing schedule contingency (lead and lag times) to build in margin; Effecting work area improvements, including installation of more lighting and segregation of work activities, to permit three-shift closure operations, and developing and maintaining current a COREsim integrated Liquid Waste model to better identify system bottlenecks.

Handling Strategy Action Items:

HS Implementation Cost ($K):	0	**Basis:** Cost is within the current baseline.
HS Implementation Schedule:	0	**Basis:** No impact to baseline schedule.

Other Handling Strategies: None

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Risk Assessment Form

ID Number: 267 **Revision:** 08 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: Even with maintaining integrated schedules and performing additional planning activities a risk remains that impacts could be realized.

Residual Likelihood:	Likely	**Basis:** Emergent issues and major assumption changes will continue to occur over the life of the program. These could continue to impact facility, operations activity and project schedules.
Residual Consequence:	Significant	**Basis:** Even with mitigation strategies, the impact to the Program would not be reduced. Co-location issues for performing major project and facility upgrades in operating facilities could lead to an extension of Program life by up to 1 year.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 163,000	**Most Likely** 325,000	**Worst Case** 650,000	Worst Case: Co-location issues for performing major project and facility upgrades in operating facilities could lead to an extension of Program life by up to 1 year.
Residual Schedule Impact :	3 Mths	6 Mths	1 Yr	Most Likely: Advanced thinking and understanding of the Program integration (System Plan) will allow decisions to be made in a timely fashion to reduce impacts to the Program life down to 6 months. Best Case: Advanced thinking and understanding of the Program integration (System Plan) will allow decisions to be made in a timely fashion to greatly reduce impacts to the Program life down to 3 months.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 163,000	**Most Likely** 325,000	**Worst Case** 650,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	3 Mths	6 Mths	1 Yr	

Risk Assumptions :

Event Comments:

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Risk Assessment Form

ID Number: 286 **Revision:** 08 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: DOE Requires DWPF AB Update to Latest STD (3009) Based on Number/Significance of Changes (DOE Risk)			
Type: Risk, External, Programmatic	**Category:** Safety	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste		
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations		
Responsible Org: SRR-ENG	**Contact:** Thomas Huff	**Date Identified:** 4/27/2009	
Statement of Event: During the development of one of the DWPF process improvements or modifications, DOE decides the 1994 Hazard Analysis, which forms part of the basis for the DWPF DSA, needs to be updated to the latest Standard (3009). This requires rework of the entire DWPF DSA and possibly new controls.			
Likelihood:	Very Likely	**Basis:** DWPF has declared the DWPF DSA 10CFR830 compliant. The HA methodology used in the DWPF DSA is still an acceptable method in the DOE standards. No significant issues have arisen from use of the current HA. However it is considered very likely that this change will be required in the near term window (next five years).	
Consequence / Benefit:	Marginal	**Basis:** A worst case consequence would be having to update the DSA while developing DWPF process modifications. The worst case would be a modification is held up for up to nine months while the DSA is being revised. This could result in not achieving a portion of the canister production rate. This could extend the Program up to 4 Mths. There would also be an additional cost to perform a full DWPF DSA update of approximately $4M.	
Most Significant Cost Impact ($k): 221,000		**Most Significant Schedule Impact :** 4 Mths	
Level:	**Moderate**	**Event Trigger:** DSA revision delays one of the DWPF process improvements. Open upon start of planned process improvement installation. Close upon completion of process improvements.	
Handling Strategy:	Accept	**Description:** Accepted as part of the current DSA approach, as operations activities are being implemented that modify DWPF (e.g. SDI, Alternate Reductant, etc.), the DSA is being updated to current practices. Ongoing discussions are being held with DOE on the activities that may impact DWPF and the Hazards analysis and safety analysis are being updated as part of those operations activities.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 286 **Revision:** 08 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: A risk remains that during the development of one of the DWPF process improvements or modifications, DOE decides the 1994 Hazard Analysis (HA), which is the basis for the DWPF DSA, needs to be updated to the latest standard. This requires rework of the entire DWPF DSA and possibly new controls.

Residual Likelihood:	Very Likely	**Basis:** By working closely with the DOE, potential changes to the Hazards Analysis and Safety Analysis are being addressed for each modification to the facility. The likelihood of this risk is marginally reduced, but it will remain very likely.
Residual Consequence:	Marginal	**Basis:** Cost of DSA revision and delay to the Program of up to 4 months (planned canister production not achieved).
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 4,000	**Most Likely** 4,000	**Worst Case** 4,000	All cases: $4M cost of DSA revision.
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 217,000	**Most Likely** 217,000	**Worst Case** 217,000	All cases: Delay to the Program of 4 Months (planned canister production not achieved).
Residual Schedule Impact :	4 Mths	4 Mths	4 Mths	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 221,000	**Most Likely** 221,000	**Worst Case** 221,000	Residual impact based on total life cycle.
Residual Schedule Impact :	4 Mths	4 Mths	4 Mths	

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

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Risk Assessment Form

ID Number: 289 **Revision:** 07 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: DWPF Infrastructure Failure Forces DWPF Outage		
Type: Risk, Internal, Programmatic	**Category:** Process Performance - Equip./Infrastr.Failures	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste	
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations	
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 4/27/2009

Statement of Event: DWPF infrastructure will be required to operate as designed for at least another 24 years. This risk is that DWPF infrastructure (Steam, HVAC, Rail, Power, remote process cranes, etc.,) degrades significantly and fails. DWPF will undergo a forced outage until infrastructure can be repaired or replaced.

Likelihood:	Very Likely	**Basis:** Building HVAC Zone 2 and 3 life extension have been completed. The DWPF steam distribution system has been in service for at least 20 years and is judged capable of distributing steam for another 24 years. Life extension and repair of the DWPF Rail System is generally associated with the melter replacement outage (last outage was in the fall of 2002) and it will require additional upkeep in future years. Power supplies are subject to focused maintenance and can be expected to continue to be reliable but the recent failure of the melter lower electrodes transformer served to highlight the issue of aging of electrical equipment. Local control stations are becoming obsolete which creates issues with obtaining replacement parts etc. DWPF Cooling Water Tower has been replaced. Other equipment e.g., Plant air dryers, purge dryers, controllers, manipulators, MPC hoist, etc., have been replaced.
Consequence / Benefit:	Marginal	**Basis:** Worst case would be a catastrophic failure of a major component of the MPC Crane e.g. gearbox or hoist drum. The MPC Crane has alternate means of retrieval and can be brought back to the Crane Maintenance Area for repair, however, the component would have to be replaced and if not on hand would have to be procured. A worst case impact would be a cost of $500K and a loss of production of up to 3 months while component is being procured and crane is being repaired.

Most Significant Cost Impact ($k): 163,500	**Most Significant Schedule Impact :** 3 Mths

Level:	**Moderate**	**Event Trigger:** Currently open; Close - upon completion of DWPF processing.
Handling Strategy:	Mitigate	**Description:** Currently, system health evaluations are performed on DWPF Zone 2 and 3 ventilation systems, repair work was identified on Zone 2 and Zone 3 ventilation and completed as part of the ongoing program. Implement recommendations of system health evaluations for all systems. Ensure critical infrastructure upgrades are identified, funded and executed. Identify critical spares for MPC crane and initiate procurement to ensure they are available should a failure occur.

Handling Strategy Action Items:

HS Implementation Cost ($K):	0	**Basis:** No cost impact
HS Implementation Schedule:	0	**Basis:** This can be completed within the schedule baseline.

Other Handling Strategies: None

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ID Number: 289 **Revision:** 07 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: A risk remains that an infrastructure failure could occur.

Residual Likelihood:	Likely	**Basis:** Likelihood has been reduced due to upgrades and life extension.
Residual Consequence:	Negligible	**Basis:** In the worst case a failure of the MPC Crane occurs. Spares are now on hand, therefore the impact would be limited to replacement of spares and minimal down time for repair of 1 week.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 500	**Most Likely** 500	**Worst Case** 500	All Cases: Replenishment of used spares will cost up to a total $500K.
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 12,500	Worst Case: Delay to production of 1 week, resulting in a direct delay to Program of 1 week. Most Likely and Best Cases: No delay to production.
Residual Schedule Impact :	0	0	1 Week	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 500	**Most Likely** 500	**Worst Case** 13,000	Residual impact based on total life cycle.
Residual Schedule Impact :	0	0	1 week	

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

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Risk Assessment Form

ID Number: 290 **Revision:** 07 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Event Title: Interface Requirements With EPC Contractor Do Not Support Integration of SWPF (DOE Risk)			
Type: Risk, External, Programmatic	**Category:** Project Integration / Interfaces	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1.2	**Assessable Element Title:** SWPF Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-OPS	**Contact:** Keith Harp	**Date Identified:** 4/27/2009	
Statement of Event: The integration of SWPF into the HLW System requires multiple technical and programmatic interfaces to be executed. A risk exists that interface requirements between contractors do not support timely and efficient integration of SWPF with the HLW System.			
Likelihood:	Unlikely	**Basis:** Due to the complexity of the interfaces identified to date, issues may arise that could impact the timely integration of SWPF into the HLW System. Tri-party approved MOA, WACs and ICDs are issued.	
Consequence / Benefit:	Negligible	**Basis:** A worst case could result in delays to the startup of SWPF. This will be limited to an estimated 1 month delay to the Program as SWPF will receive priority for identification and resolution of issues early in the execution of the project. The early identification and resolution prevents the need for significant rework of hardware and limits the impact to programmatic issues (e.g. procedures etc.). Costs would be drawn from the risk-based contingency funding of the operations activities and not impact the Program as a near-term cost.	
Most Significant Cost Impact ($k): 54,000		**Most Significant Schedule Impact :** 1 Mth	
Level:	**Low**	**Event Trigger:** SWPF startup is delayed due to interface issues.	
Handling Strategy:	Mitigate	**Description:** These risks are identified and managed within the SWPF Federal Project Risk Management Plan and within SRR Risk and Opportunity Management Plan(s). SRR actions include: Continuing to execute the current interface process to address interface design requirements early; Continuing involvement with SWPF design reviews; Performing CoreSim modeling to evaluate pinch points; Maintaining the existing dedicated team to enhance the interface with SWPF and to ensure that all scope within Liquid Waste that is needed to support SWPF startup is coordinated and integrated to ensure timely startup and continued uninterrupted SWPF operation. SWPF Federal Project actions are documented within V-RMP-J-00001 and managed under the Federal Project Risk Management Plan. Develop a detailed integrated schedule for SRR support of SWPF tie-in, testing and startup. Additional actions under this PBS-SR-0014 ROMP are limited to ensuring salt processing capabilities should this risk be realized. Created a schedule integration team (Parsons, SRR and DOE) to focus on interface points and integration issues. Assign dedicated SRR startup resources to SWPF startup team as requested by SWPF FPD.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** No additional cost.	
HS Implementation Schedule:	0	**Basis:** No impact to Program baseline schedule	
Other Handling Strategies: Use common function SRS Procedures and Manuals to reduce costs in Program development while aligning with existing Liquid Waste Program guidelines. Define the R2A2 between organizations avoiding confrontational cross-organizational issues. Staff SWPF open/future positions with existing SRR personnel to provide a trained and competent workforce which is aligned with site safety ethic and programs.			

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Risk Assessment Form

ID Number: 290 **Revision:** 07 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Statement of Residual Risk: The application of coordinated risk management by both the SWPF Federal Project and by SRR reduces this risk, however it still may occur.

Residual Likelihood:	Very Unlikely	**Basis:** The application of coordinated risk management by both the SWPF Federal Project and by SRR reduces the likelihood of this risk.
Residual Consequence:	Negligible	**Basis:** The consequence is reduced by the execution of risk management by the Federal Project and SRR and by the ability to process salt if SWPF is delayed. A worst case program delay of 1 Mth.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	N/A
	0	0	0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Worst Case: Program Impact of 1 Mth.
	12,500	25,000	54,000	Most Likely Case: Program Impact of 2 Wks.
Residual Schedule Impact :	1 Wk	2 Wks	1 Mth	Best Case: Program Impact of 1 Wk.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Residual impact based on risk having out-year consequences only.
	12,500	25,000	54,000	
Residual Schedule Impact :	1 Wk	2 Wks	1 Mth	

Risk Assumptions :

3. The Salt Waste Processing Facility (SWPF) becomes operational December 3, 2018.

-Required Tank Farms, DWPF, and SPF modifications (e.g., Salt Disposition integration [SDI]) for SWPF, through Readiness Assessment (RA), will be complete two months prior to the initiation of the SWPF Operational Readiness Review (ORR)

31. Tank Farm feed preparation infrastructure modifications required to support SWPF processing rates including:

-H-Tank Farm Blend tanks readiness for salt solution preparation

-F-Tank Farm Blend tanks readiness for salt solution preparation

-Tank 49 readiness as SWPF feed tank

-Mixing capabilities

-Enhanced transfer capabilities

-Transfer routes provided to feed tank.

Event Comments: This is an interface risk with the DOE-SR SWPF Project.

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Risk Assessment Form

ID Number: 291 **Revision:** 09 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Skilled Craft Labor is Not Available to Support Liquid Waste Needs			
Type: Risk, Internal, Programmatic	**Category:** Resources/Conditions	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-CON	**Contact:** Brandon Witt	**Date Identified:** 4/27/2009	
Statement of Event: Skilled Craft labor resources will be required to support multiple Liquid Waste activities simultaneously. A risk exists that these safety conscious resources that possess specialized welding, electrical, piping, etc. skills are not available when needed and Liquid Waste activities are impacted.			
Likelihood:	Likely	**Basis:** Processes are in place to acquire resources from the building trades (Union Halls). If Union Halls cannot provide these resources, it is permissible for the local unions to seek craft labor from outside the immediate area. However, even with these avenues available, major resource draws such as plant Vogtle, V. C. Sumner, MOX etc., will compete with Liquid Waste for resources.	
Consequence / Benefit:	Marginal	**Basis:** The worst case impact could result in up to a cumulative 3 month delay to the Program due to critical path projects/operations activities being delayed.	
Most Significant Cost Impact ($k): 163,000		**Most Significant Schedule Impact :** 3 Mths	
Level:	**Moderate**	**Event Trigger:** Craft labor is not available when required. Currently open. Close upon completion of Program.	
Handling Strategy:	Mitigate	**Description:** As part of ongoing craft support planning, availability will be regularly validated with local unions and shortfalls predicted in sufficient time to work with local unions to seek craft labor from outside the immediate area. Mechanisms are in place and maintained to facilitate obtaining additional craft labor when needed.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** Cost is within existing baseline.	
HS Implementation Schedule:	0	**Basis:** No impact to baseline schedule	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 291 **Revision:** 09 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: A risk remains that delays could still be realized due to unavailability of craft labor.

Residual Likelihood:	Unlikely	**Basis:** Likelihood has been reduced by extensive planning and having mechanisms in place to obtain craft labor.
Residual Consequence:	Marginal	**Basis:** Unavailability of craft labor results in 3 months cumulative delay to the program.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 108,000	**Worst Case** 163,000	Worst Case: Unavailability of craft labor results in 3 months cumulative delay to the program.
Residual Schedule Impact :	1 Mth	2 Mths	3 Mths	Most Likely: Unavailability of craft labor results in 2 months cumulative delay to the program. Best Case: Unavailability of craft labor results in 1 month cumulative delay to the program.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 108,000	**Worst Case** 163,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	1 Mth	2 Mths	3 Mths	

Risk Assumptions :

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 295 **Revision:** 08 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Event Title: Tank Farm Transfer Line Failure		
Type: Risk, Internal, Technical	**Category:** Process Performance - Equip./Infrastr.Failures	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: SRR-ENG	**Contact:** John Contardi	**Date Identified:** 4/27/2009

Statement of Event: Transfer lines within the Tank Farms are over 30 years old (some are approaching 60 years old) and will be relied upon to be functional for another 25 years. These lines will be necessary for processing of tank contents, salt feed preparation and tank cleaning activities. A risk exists that a line needed for one of these activities degrades to the extent that it becomes unserviceable and cannot be used as required.

Likelihood:	Very Likely	**Basis:** The core pipes of Tank Farm transfer lines are stainless steel and therefore subject to very little degradation, however, the outer jackets are carbon steel which can degrade. Recent experience with Tank 37 and 38 transfer line jacket degradation indicates this may be a very likely event.
Consequence / Benefit:	Significant	**Basis:** Degradation of a major portion or portions of one of the longer Tank Farm transfer lines (e.g. jacket degrades to a point that transfer line fails leak testing and cannot be used) could result in the need to replace a substantial portion of the line. The delay could be up to 1 year (based on Tank 37 and 38 line failures) and the cost of transfer line repair up to $20M. In the worst case, the transfer line would be a critical connection that results in a day for day slippage of the System Plan schedule (i.e. no re-sequencing of tank processing/cleaning presents itself as a workaround).

Most Significant Cost Impact ($k): 670,000	**Most Significant Schedule Impact :** 1 Yr

Level:	**High**	**Event Trigger:** Currently open; Close on completion of program.
Handling Strategy:	Mitigate	**Description:** Monitoring specific transfer line health and developing tailored inspection and maintenance activities as part of the ongoing program. Investigate transfer line alternatives (hose in hose) and develop approved guidelines as to when they can be deployed. Investigate with regulators the limited use of degraded secondary containment for transfers. (case by case risk-based evaluation).

Handling Strategy Action Items:

295.1 Investigate transfer line alternatives (hose in hose) and develop approved guidelines as to when they can be deployed., John Contardi

295.2 Investigate with regulators the limited use of degraded secondary containment for transfers. (case by case risk-based evaluation)., Owen Stevens

HS Implementation Cost ($K):	N/A	**Basis:** N/A
HS Implementation Schedule:	N/A	**Basis:** N/A

Other Handling Strategies: Investigate technologies to repair transfer line jackets that have failed and have them ready for implementation within the Tank Farms. Once transfer lines are no longer in service, they could be inspected to facilitate predictive maintenance. Identify critical transfer lines and evaluate monitoring frequency increases.

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Risk Assessment Form

ID Number: 295 **Revision:** 08 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Statement of Residual Risk: The risk still remains that a transfer line can fail.

Residual Likelihood:	Very Likely	**Basis:** Likelihood remains unchanged.
Residual Consequence:	Significant	**Basis:** Degradation of a major portion or portions of one of the longer Tank Farm transfer lines (e.g. jacket degrades to a point that transfer line fails leak testing and cannot be used) could result in the need to replace a substantial portion of the line. The delay could be up to 1 year (based on Tank 37 and 38 line failures) and the cost of transfer line repair up to $20M. In the worst case, the transfer line would be a critical connection that results in a day for day slippage of the System Plan schedule (i.e. no re-sequencing of tank processing/cleaning presents itself as a workaround).
Residual Risk Level:	**High**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	500	5,000	20,000
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

Worst Case: An additional cost of $20M to repair line.

Most Likely Case: An additional cost of $5M to repair line or use alternate configuration.

Best Case: The cost to develop and gain approval of a limited use case or repair. ($500K)

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	54,000	163,000	650,000
Residual Schedule Impact :	1 Mth	3 Mths	1 Yr

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: A schedule delay of 1 year to the program to repair line.

Most Likely Case: A schedule delay of 3 Mths to the program to repair line or use an alternate transfer mechanism (e.g. hose in hose or above grade hard pipe).

Best Case: A schedule delay of 1 Mth to develop a case for limited use or repair.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	54,500	168,000	670,000
Residual Schedule Impact :	1 Mth	3 Mths	1 Yr

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on total life cycle.

Risk Assumptions :

31. Tank Farm feed preparation infrastructure modifications required to support SWPF processing rates including:

-H-Tank Farm Blend tanks readiness for salt solution preparation

-F-Tank Farm Blend tanks readiness for salt solution preparation

-Tank 49 readiness as SWPF feed tank

-Mixing capabilities

-Enhanced transfer capabilities

-Transfer routes provided to feed tank.

Event Comments: If the transfer line were in the transfer path from H-Canyon, Canyon could be impacted. This is an interface risk with PBS-SR-0011/12. This is an interface risk with the DOE-SR SWPF Project.

PBS SR-0014

Risk Assessment Form

ID Number: 297 **Revision:** 07 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Event Title: Infrastructure Modifications Are Not Completed When Required to Support SWPF Startup.			
Type: Risk, Internal, Programmatic	**Category:** Project Integration / Interfaces	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1.2	**Assessable Element Title:** SWPF Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-OPS	**Contact:** Keith Harp	**Date Identified:** 4/27/2009	
Statement of Event: SWPF is planned to begin operations in December 2018. Modifications to the site infrastructure must be completed prior to December 2018 to support Authorization to Operate (ATO). A risk exists that these infrastructure modifications cannot be completed to support SWPF startup.			
Likelihood:	Unlikely	**Basis:** The infrastructure modifications are extensive. While some of the scope has been completed, a significant portion remains. Currently, the scope is tied to finish and allow 1 year prior to ATO. As modifications to be performed during the SWPF tie-in outage are to be performed in an extremely tight window, a focus is being placed on maximizing the completion of work possible prior to the window.	
Consequence / Benefit:	Negligible	**Basis:** The worst case for being unable to complete these modifications is estimated at two months. This would be a direct impact to Program completion. If funding is limited or scope change occurs, the impact could be greater than 2 months (see Risk 027).	
Most Significant Cost Impact ($k): 108, 000	**Most Significant Schedule Impact :** 2 Mths		
Level:	**Low**	**Event Trigger:** Open upon start of SWPF ORR/Close on start of SWPF Hot Ops.	
Handling Strategy:	Avoid	**Description:** If necessary, the SWPF tie-in outage work will be planned with a 24/7 work schedule to remove the schedule variance and executed on that basis as necessary. Develop a detailed integrated schedule for SRR support of SWPF tie-in, testing and startup. Perform RIE(s) to reduce needed outage window and implement recommendations. Scope is being implemented with approximately 1 year buffer to ATO.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** SDI projects will use this as a planning basis, therefore no additional cost is incurred.	
HS Implementation Schedule:	0	**Basis:** No impact to schedule.	
Other Handling Strategies: None			

PBS SR-0014

Risk Assessment Form

ID Number: 297 **Revision:** 07 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Statement of Residual Risk: This risk has been avoided

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

31. Tank Farm feed preparation infrastructure modifications required to support SWPF processing rates including:

-H-Tank Farm Blend tanks readiness for salt solution preparation

-F-Tank Farm Blend tanks readiness for salt solution preparation

-Tank 49 readiness as SWPF feed tank

-Mixing capabilities

-Enhanced transfer capabilities

-Transfer routes provided to feed tank.

Event Comments: This is an interface risk with the Federal project for SWPF. SRR will continue to execute as much of the scope ahead of schedule as funding and budget will allow.

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Risk Assessment Form

ID Number: 299 **Revision:** 11 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Tank Leaks to Environment During Tank Cleaning Step			
Type: Risk, Internal, Technical	**Category:** Process Performance - Equip./Infrastr.Failures	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 6.0	**Assessable Element Title:** Closure (Tanks, Evap. & Ancil. Equip) Including Heel Removal		
WBS Number: 01.90.01	**WBS Title:** Waste Removal and Tank Closure		
Responsible Org: SRR-CL	**Contact:** Janice Williams	**Date Identified:** 4/27/2009	
Statement of Event: During Tank closure activities, waste tanks will be cleaned with water, caustic, and/or acid to remove residual material. A risk exists that during cleaning, a leak develops and releases material through the containment to the environment.			
Likelihood:	Very Unlikely	**Basis:** SRS Tanks have developed leak sites in the past and have self-sealed. These leak sites will most likely re-open during tank cleaning and new leak sites are more likely to develop during the acid cleaning process due to the materials being introduced and the mechanical forces at work within the tank. The remaining type IV tanks have no leaks. A breach of containment due to pitting and corrosion from chemical cleaning would most likely be limited to Type I and Type II tanks which have contained high Aluminum sludge (H-area tanks). This risk of a leak outside secondary containment is considered very unlikely. Chemical cleaning was completed on Tanks 5, 6, and 12, 16 and 24 without significant leak site activation. Mechanical cleaning was performed on Tanks 18, 19, 5, 6, 12 and 16 without significant leak site activation.		
Consequence / Benefit:	Severe (Critical)	**Basis:** In the worst case, failure of the primary and secondary containment will occur. The worst case would be a release of waste to the underlying soils. With no simple method of removal, a delay to tank closure of up to 2 years could occur while technology is developed to sample and clean out contamination. Cost of technology development and deployment could be up to $20M. As the tank closure activities would be moved to another tank, the delay would not impact the Program if it occurred early in the closure process, however if this occurred at the end of the Program, there would be a delay to the closure of the Program. The additional cost of maintaining the tank past closure date of $1M per year = $2M). The 2 year impact is included in the $22M as this will be the last activity being performed.		
Most Significant Cost Impact ($k): 22,000		**Most Significant Schedule Impact :** 2 yrs	
Level:	**Moderate**	**Event Trigger:** Currently open, close upon completion of last tank cleaning.	
Handling Strategy:	Mitigate	**Description:** Maintain liquid levels as low as practical during cleaning. Use lower chemical concentrations and limit acid residence time. Implement staged contingency transfer system per operations plan; Avoid risk on single wall (Type IV) tanks by not performing acid cleaning in these tanks. Developing technology to perform enhanced mechanical cleaning is an ongoing activity. For tanks evaluated as being susceptible to corrosion failure, design and install annulus transfer capability prior to tank cleaning. As lessons are learned relative to the potential impacts of chemical cleaning with limited concentrations, utilize them to establish acceptable thresholds for chemical cleaning.		
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** The cost is within the current baseline.	
HS Implementation Schedule:	0	**Basis:** These activities can be performed concurrently with the current scheduled activities.	
Other Handling Strategies: None			

PBS SR-0014

Risk Assessment Form

ID Number: 299 **Revision:** 11 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: Risk has been reduced to an acceptable level on Type IV tanks by not employing acid cleaning. For other tanks, leaks are detected and leakage is captured by secondary containment and redirected back into a tank primary until cleaning process is completed.

Residual Likelihood:	Very Unlikely	**Basis:** Likelihood has been reduced, but remains very unlikely.
Residual Consequence:	Severe (Critical)	**Basis:** Failure of the primary and secondary containment occurs. There would be a release of waste to the underlying soils. With no simple method of removal, a delay to tank closure of up to 2 years could occur while technology is developed to sample and clean out contamination. Cost of technology development and deployment could be up to $20M. and an additional cost of maintaining the tank past closure date of $1M per year = $2M). If at the end of the Program, a two year delay in turnover to PBS-30 could occur.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 22,000	**Most Likely** 22,000	**Worst Case** 22,000
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

All Cases: Failure of the primary and secondary containment occurs. There would be a release of waste to the underlying soils. With no simple method of removal, a delay to tank closure of up to 2 years could occur while technology is developed to sample and clean out contamination. Cost of technology development and deployment could be up to $20M and an additional cost of maintaining the tank past closure date of $1M per year = $2M).

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0
Residual Schedule Impact :	0	0	2 Yr

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: If at the end of the Program, a two year delay in turnover to PBS-30 could occur.

Most Likely and Best Cases: No Program delays.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 22,000	**Most Likely** 22,000	**Worst Case** 22,000
Residual Schedule Impact :	0	0	0

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on total life cycle.

Risk Assumptions :

Event Comments: This is a cross-cutting risk with PBS-30 which would have additional scope to perform final closure which may have to be initiated early to satisfy regulators in the event of a leak during the early stages of Program execution, however in the final stages of execution, this would be a day for day slip in turnover to PBS-30.

PBS SR-0014

Risk Assessment Form

ID Number: 325 **Revision:** 07 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: DWPF Dry Frit System Experiences Frequent Pluggage		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste	
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations	
Responsible Org: SRR-ENG	**Contact:** Eric Freed	**Date Identified:** 4/27/2009

Statement of Event: A dry frit system is planned for DWPF as part of an effort to reduce water additions to the DWPF Chemical Process Cell (CPC). This system will transfer dry frit to the CPC for addition to the SME. A risk exists that after installation the dry feed system experiences frequent pluggage. Production at DWPF is impacted.

Likelihood:	Very Unlikely	**Basis:** The retrofit of a dry frit feed system to an existing remote canyon facility will be a first of a kind application. Full scale testing/mockups have been successfully performed. Some uncertainty remains with being able to maintain a fully operational system without encountering pluggage.
Consequence / Benefit:	Marginal	**Basis:** The worst case impact would be that the production of DWPF is impacted to such a degree that the dry feed system has to be removed and the previous feed system re-installed. A delay for this modification can be up to 3 months with cost up to $5M.

Most Significant Cost Impact ($k): 168,000 **Most Significant Schedule Impact :** 3 Mths

Level:	**Low**	**Event Trigger:** Open on start of DWPF production with dry frit system, close upon end of DWPF operations.
Handling Strategy:	Mitigate	**Description:** Minimize the D&D of the existing system to allow wet frit slurry delivery system to be easily re-installed. Perform extensive mockup testing of the dry frit delivery system before installation. Testing to include a range of transient conditions that may be encountered during operation. Gather and utilize lessons learned from other facilities utilizing this process (e.g. Sellafield).

Handling Strategy Action Items:

325.2 Perform extensive mockup testing of the dry frit delivery system before installation. Testing to include a range of transient conditions that may be encountered during operation., John laukea

325.3 Gather and utilize lessons learned from other facilities utilizing this process (e.g. Sellafield)., Pedro Flores

HS Implementation Cost ($K):	0	**Basis:** Within the cost baseline.
HS Implementation Schedule:	0	**Basis:** No impact to schedule if design is accelerated.

Other Handling Strategies: None

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Risk Assessment Form

ID Number: 325 **Revision:** 07 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: After testing and resolving issues encountered with mockup testing, a risk remains that the dry frit system may encounter pluggage.

Residual Likelihood:	Very Unlikely	**Basis:** Likelihood is reduced by testing of the process and resolution of issues using a mockup but still remains very unlikely.
Residual Consequence:	Negligible	**Basis:** Duration of outage required to re-install wet frit slurry system has been reduced to 2 months and cost has been reduced to $4M.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 4,000	**Most Likely** 4,000	**Worst Case** 4,000	All Cases: Cost of removing dry frit feed system and installing wet frit slurry system.
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 108,000	**Most Likely** 108,000	**Worst Case** 108,000	All Cases: Delay of 2 months to remove dry frit feed system and install wet frit slurry system.
Residual Schedule Impact :	2 Mths	2 Mths	2 Mths	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 112,000	**Most Likely** 112,000	**Worst Case** 112,000	Residual impact based on total life cycle.
Residual Schedule Impact :	2 Mths	2 Mths	2 Mths	

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

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Risk Assessment Form

ID Number: 332 **Revision:** 07 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: DWPF Facility Impacts Due to Additional Shielding Needs			
Type: Risk, Internal, Technical	**Category:** Design	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste		
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations		
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 4/27/2009	
Statement of Event: Once it begins operations, SWPF plans to begin feeding strip effluent and MST sludge solids to DWPF. A risk exists that the increased Ci/gal Cs-137 concentrations challenge the shielding capability of DWPF.			

Likelihood:	Very Likely	**Basis:** The SWPF feed to DWPF may be as high as 66 Ci/gal Cs-137 and after processing may be concentrated up to 250 Ci/gal Cs-137. Also, the SWPF feed will also include a much higher concentration of neutron emitting nuclides. Preliminary evaluations indicate the Sample Cell shielding (Mezzanine level) may not support continuous occupancy and doses around the SCT may increase. (Reference LWO-RPE-2009-00018, rev 0).
Consequence / Benefit:	Negligible	**Basis:** The worst case would result in placement of additional shielding around the sample cells and additional administrative controls (e.g. restrictions within the Low Point Pump Pit [LPPP] and around the Shielded Canister Transporter [SCT]). The administrative controls are assumed to not impact the Program, however, the modifications to install additional shielding will incur a cost impact and a delay if addressed after operations have begun and higher radiation fields encountered. To design and reconfigure/add shielding in the Sample Cell to reduce worker exposure to As Low As Reasonably Achievable (ALARA) levels is estimated to cost $5M. A Program delay of up to 1 month would be incurred if it were necessary to halt DWPF operations to install the additional shielding.

Most Significant Cost Impact ($k): 59,000	**Most Significant Schedule Impact :** 1 Mth

Level:	**Low**	**Event Trigger:** Open upon start of SWPF operations, close upon completion of Program.
Handling Strategy:	Avoid	**Description:** Continue shielding evaluations and develop a strategy which combines administrative controls and shielding and prepare to implement this strategy during an appropriate DWPF outage(s). Implement Lab Waste Handling modifications.

Handling Strategy Action Items:

332.2 Develop administrative controls for SCT operations based on the higher SWPF feed., Joel Cantrell

332.3 Develop a strategy of administrative and engineered controls within DWPF to reduce personnel exposure to ALARA based on the higher SWPF feed., Joel Cantrell

332.4 Install engineered controls to DWPF as identified within the developed strategy., Joel Cantrell

HS Implementation Cost ($K):	0	**Basis:** Cost of shielding (estimated at $5M) is outside the current baseline. Evaluations can be performed within the current cost baseline.
HS Implementation Schedule:	0	**Basis:** No impact if designed prior to outage and scheduled for outage.

Other Handling Strategies: None

PBS SR-0014 **Risk Assessment Form**

ID Number: 332 **Revision:** 07 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: Risk has been avoided.

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 343 **Revision:** 07 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Size Reduced Zeolite Cannot be Resuspended in Waste Tanks			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 6.0	**Assessable Element Title:** Closure (Tanks, Evap. & Ancil. Equip) Including Heel Removal		
WBS Number: 01.90.01	**WBS Title:** Waste Removal and Tank Closure		
Responsible Org: SRR-ENG	**Contact:** John Occhipinti	**Date Identified:** 4/27/2009	

Statement of Event: Zeolite was deposited in several waste tanks during previous operations at SRS. Use of the sand mantis successfully demonstrated the ability to remove the material from Tanks 18 and 19. The current plan for waste removal, cleaning and closure is to remove the zeolite from tanks (where zeolite is present), size-reduce the zeolite during waste removal and transfer to another tank to be re-suspended when that tank undergoes waste removal. A risk exists that the size-reduced zeolite does not behave as predicted and is difficult to re-suspend.

Likelihood:	Very Unlikely	**Basis:** SRNL testing indicates this material can be re-suspended if size reduced.
Consequence / Benefit:	Negligible	**Basis:** The worst case would be the introduction of size reduced zeolite into a tank containing cooling coils (Tank 7) which previously did not contain any zeolite. This would now create a new problem of removal within this tank and a delay to cleaning. Once a method has been developed for removal from Tank 7, then this risk will be avoided on future tanks. There is no impact to the Program, however additional costs are incurred on this tank of up to $10M to develop and deploy a technology to vacuum clean the tank and grind the zeolite prior to deposition in another tank.
Most Significant Cost Impact ($k): 10,000		**Most Significant Schedule Impact :** 0
Level:	**Low**	**Event Trigger:** Efforts to resuspend size-reduced zeolite on Tank 7 are unsuccessful. Open on Tank 7 waste removal. Close on waste removal from Tank 7.
Handling Strategy:	Mitigate	**Description:** Where practical, do not transfer zeolite to any tanks with coils that do not already have zeolite present.
Handling Strategy Action Items:		
HS Implementation Cost ($K):	0	**Basis:** Can be implemented without any additional cost to the program.
HS Implementation Schedule:	0	**Basis:** Can be worked in parallel without impacting schedule

Other Handling Strategies: Where MEP cleaning fails to remove zeolite, review, relative to 3116 determinations on a case by case basis, allowing the zeolite to remain.

PBS SR-0014 **Risk Assessment Form**

ID Number: 343 **Revision:** 07 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: A risk remains that it may not be practical to always use tanks that already contain zeolite or tanks that are easier to clean as receipt tanks for size-reduced zeolite.

Residual Likelihood:	Very Unlikely	**Basis:** The likelihood has been reduced, but only slightly and remains very unlikely.
Residual Consequence:	Negligible	**Basis:** Additional costs are incurred on this tank of up to $10M to develop and deploy a technology to vacuum clean the tank and grind the zeolite prior to deposition in another tank.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 10,000	**Most Likely** 10,000	**Worst Case** 10,000	All Cases: Additional costs are incurred on this tank of up to $10M to develop and deploy a technology to vacuum clean the tank and grind the zeolite prior to deposition in another tank.
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 10,000	**Most Likely** 10,000	**Worst Case** 10,000	Residual impacts based on risk having near-term consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

22. Types I, II, and IV tanks (Tanks 1–24):

-Waste Removal and Tank Removal from Service commitments are per the FFA

- Types I, II, and IV tanks (including Tanks 4, 7, 8, 11, and 21 through 24) may be used to optimize output of the Plan.

23. Type III and IIIA (Tanks 25–51):

-While the Type III and IIIA tanks are not included in the FFA, commitment for completion of waste removal (bulk waste and heel) from all tanks is per the STP

-Tanks are not required to be isolated and grouted to meet the STP

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 344 **Revision:** 08 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Event Title: 3H Evaporator Pot Failure			
Type: Risk, Internal, Technical	**Category:** Process Performance - Equip./Infrastr.Failures	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 3.0	**Assessable Element Title:** Concentrate Liquid Radioactive Waste		
WBS Number: 01.90.02.01	**WBS Title:** F-H Tank Farm Facilities		
Responsible Org: SRR-ENG	**Contact:** John Contardi	**Date Identified:** 4/27/2009	
Statement of Event: The 3H Evaporator will be used to volume reduce waste in the H Tank Farm system. A risk exists that a pot failure occurs, forcing an extended outage of the 3H Evaporator system.			
Likelihood:	Unlikely	**Basis:** By performing system health evaluations and regular maintenance, the likelihood of failure is reduced. Evaporator operation is planned to continue well beyond design life.	
Consequence / Benefit:	Significant	**Basis:** No spare 3H Evaporator Pot is available, therefore the worst case would be a failure mode which resulted in the need to totally replace the Evaporator Pot. A procurement and installation cycle of 18 months is estimated with a cost of $20M to fabricate and install a replacement Evaporator Pot. The inability to volume reduce waste in support of DWPF sludge batch preparation will result in an 18 month delay to DWPF processing. This could result in up to an 18 month delay to the Program due to inability to process SWPF strip effluent and sludge.	
Most Significant Cost Impact ($k): 995,000		**Most Significant Schedule Impact :** 18 Mths	
Level:	**Moderate**	**Event Trigger:** Open/ Close on termination of 3H Evaporator operations.	
Handling Strategy:	Mitigate	**Description:** Develop as far as practical the design and procurement specification for a replacement evaporator pot, to minimize the time needed to procure a replacement. Evaluate alternate handling of sludge wash water as salt process adjustment medium.	
Handling Strategy Action Items: 344.1 Develop as far as practical the design and procurement specification for a replacement evaporator pot, to minimize the time needed to procure a replacement., John Contardi 344.2 Evaluate alternate handling of sludge wash water as salt process adjustment medium., Ryan McNew			
HS Implementation Cost ($K):	0	**Basis:** Within the current baseline.	
HS Implementation Schedule:	0	**Basis:** No impact to schedule.	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 344 **Revision:** 08 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Statement of Residual Risk: 3H Evaporator Pot may still fail.

Residual Likelihood:	Unlikely	**Basis:** Likelihood has not changed.
Residual Consequence:	Marginal	**Basis:** Program delayed while 3H Evaporator Pot is being changed out. This impact has been reduced to 6 months by reducing the procurement cycle duration and using alternate strategy for use of wash water. Additional cost of procuring a new Evaporator Pot will still be incurred ($20M).
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 345,000	**Most Likely** 345,000	**Worst Case** 345,000	All Cases: Program delayed while 3H Evaporator Pot is being procured and changed out. Additional cost of procuring a new Evaporator Pot ($20M).
Residual Schedule Impact :	6 Mths	6 Mths	6 Mths	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 345,000	**Most Likely** 345,000	**Worst Case** 345,000	Residual impact based on outyear impacts only.
Residual Schedule Impact :	6 Mths	6 Mths	6 Mths	

Risk Assumptions :

32. The 2H Evaporator System is used to evaporate DWPF recycle. The 3H Evaporator is used to process streams that minimize scale production, i.e., canyon wastes and sludge batch decants. The evaporator system feed and concentrate receipt tanks configuration is:

- 3H: Feed – Tank 32; Receipt – Tanks 30 and Tank 37
- 2H: Feed – Tank 43; Receipt – Tank 38.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 346 **Revision:** 08 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Tank Closure Sampling Strategy is Not Effective			
Type: Risk, Internal, Technical	**Category:** Regulatory and Environmental	**Group:** 3 - Out Year Risk and Consequences, with Near Term Risk Handling Strategy	
Assessable Element : 6.0	**Assessable Element Title:** Closure (Tanks, Evap. & Ancil. Equip) Including Heel Removal		
WBS Number: 01.90.01	**WBS Title:** Waste Removal and Tank Closure		
Responsible Org: SRR-ENG	**Contact:** John Occhipinti	**Date Identified:** 4/27/2009	

Statement of Event: The current tank closure sampling strategy will establish a 95% confidence level of residual material characterization within a given tank. This is achieved by sampling at various predetermined points within the tank. Sufficient samples are planned, taken, analyzed and their results statistically analyzed to achieve this confidence level. A risk exists that when the analysis results are reviewed, the variability (scatter) results in a lower than 95% confidence level. More samples may be required to be taken, analyzed and their data added to the statistical model to raise the confidence level to meet or exceed the accepted 95%.

Likelihood:	Very Unlikely	**Basis:** This approach has been implemented at SRS and has achieved a 95% confidence level. Although statistically sound, there remains a significant amount of uncertainty, for remaining tanks, of how great the sample scatter based on combination of the final analysis results will be (i.e. it is difficult to project the actual number of samples required until some historical data has been accrued for using this method). Based on historical data to date, this event is considered very unlikely.
Consequence / Benefit:	Negligible	**Basis:** The worst case consequence would be the combined sample results do not produce an acceptable confidence level and more sampling is required. This could require openings to be cut in the tank roof to facilitate the additional sampling. Assuming several samples are required up to 3 access openings ($500K per access opening) may be needed. Additional analyses will be required ($1M) and a delay of up to 12 months would be incurred to tank closure. Although the tank closure is delayed up to 12 months, it is not on critical path to Program completion, therefore this is not a delay to the Program. It is expected that after more tank samplings are performed the number, type and location of samples required to achieve a 95% confidence level will be better understood and these lessons learned applied to future closure sampling. A one year delay would also incur an additional cost to maintain the tanks not closed per schedule. Additional costs to maintain a tank at 12 months past closure date ($1M).
Most Significant Cost Impact ($k): 3,500		**Most Significant Schedule Impact :** 0
Level:	**Low**	**Event Trigger:** Statistical analysis of sample results fails to establish a 95% confidence level in tank characterization.
Handling Strategy:	Mitigate	**Description:** Review sampling and analysis results as early as possible and determine the need for additional sampling on preliminary statistical analysis results. Lessons learned will be used to modify the sampling strategies for the remaining tanks and future occurrences of the event may be avoided.
Handling Strategy Action Items:		
HS Implementation Cost ($K):	0	**Basis:** Included in the existing cost baseline.
HS Implementation Schedule:	0	**Basis:** No impact to existing schedule baseline.
Other Handling Strategies: None		

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Risk Assessment Form

ID Number: 346 **Revision:** 08 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: Although schedule delay may be reduced by executing closure sampling strategy as early as possible, the risk may still be realized.

Residual Likelihood:	Very Unlikely	**Basis:** The likelihood of this event remains the same.
Residual Consequence:	Negligible	**Basis:** The worst case consequence would be the combined sample results do not produce an acceptable confidence level and more sampling is required. This could require openings to be cut in the tank roof to facilitate the additional sampling. Assuming several samples are required up to 3 access openings ($500K per access opening) may be needed. Additional analyses will be required ($1M) and a delay of up to 12 months would be incurred to tank closure. Although the tank closure is delayed up to 12 months, it is not on critical path to Program completion, therefore this is not a delay to the Program. It is expected that after more tank samplings are performed the number, type and location of samples required to achieve a 95% confidence level will be better understood and these lessons learned applied to future closure sampling. A one year delay would also incur an additional cost to maintain the tanks not closed per schedule. Additional costs to maintain a tank at 12 months past closure date ($1M).
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	N/A
	0	0	0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Worst Case: Additional samples are required using 3 additional access openings ($500K each=$1.5M). Cost of analysis ($1M) and $1M costs to maintain tank an additional year.
	2,500	3,000	3,500	
Residual Schedule Impact :	0	0	0	Most Likely: Additional samples are required using 2 additional access openings ($500K each=$1M). Cost of analysis ($1M) and $1M costs to maintain tank an additional year. Best Case: Additional samples are required using 1 additional access openings ($500K). Cost of analysis ($1M) and $1M costs to maintain tank an additional year.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Impact based on risk having outyear consequences only.
	2,500	3,000	3,500	
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

22. Types I, II, and IV tanks (Tanks 1–24):

-Waste Removal and Tank Removal from Service commitments are per the FFA

- Types I, II, and IV tanks (including Tanks 4, 7, 8, 11, and 21 through 24) may be used to optimize output of the Plan.

23. Type III and IIIA (Tanks 25–51):

-While the Type III and IIIA tanks are not included in the FFA, commitment for completion of waste removal (bulk waste and heel) from all tanks is per the STP

-Tanks are not required to be isolated and grouted to meet the STP

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 358 **Revision:** 06 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Event Title: Solids Build up Within Blend and Feed Tanks			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1.2	**Assessable Element Title:** SWPF Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 8/25/2009	
Statement of Event: During salt batch preparation for SWPF, salt waste containing solids will be transferred through the blend and feed tanks during which time solids will continue to settle. A risk exists that the solids build up in the blend and feed tanks results in loss of working space which reduces the ability to provide SWPF with feed at the required rate.			
Likelihood:	Unlikely	**Basis:** Although solids will continue to settle in the blend and feed tanks throughout the feed preparation process, calculations indicate that it is unlikely that they will be significant enough to impact SWPF feed throughput.	
Consequence / Benefit:	Marginal	**Basis:** In the worst case the solids build up limits the working space to such a degree that the blend tank must undergo a solids removal campaign. Prior to solids removal, a new blend tank must be readied, (to maintain feed preparation capabilities) and due to the reduction in blend tank capacity, the available feed rate drops to 6 Mgals/year as opposed to the required 9 Mgals/year. This is assumed to happen twice during the Program life with the solids removal campaign taking 12 months to complete. This incremental drop in processing throughput due to reduced feed availability could extend the Program up to 8 months. There will be an additional cost to ready an alternate blend tank, two times, (emptying tank and equipment modifications) of $15M per occurrence (assuming maximizing the re-use of equipment where applicable).	
Most Significant Cost Impact ($k): 463,000		**Most Significant Schedule Impact :** 8 Mths	
Level:	**Low**	**Event Trigger:** Open upon SWPF processing; Close upon completion of Program.	
Handling Strategy:	Mitigate	**Description:** The likelihood of solids accumulation in the blend and feed tanks is reduced by the enforcement of pump suction to settled solids spacing requirements. Equipment design assists with avoiding the introduction of solids from the feed tank.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** Within the current baseline.	
HS Implementation Schedule:	0	**Basis:** No impact to the baseline schedule.	
Other Handling Strategies: Pumps currently not planned for replacement could be replaced with pumps which reduce settling time requirements.			

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Risk Assessment Form

ID Number: 358 **Revision:** 06 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Statement of Residual Risk: A risk remains that the solids build up in the blend and feed tanks results in loss of working space which reduces the ability to provide SWPF with feed at the required rate.

Residual Likelihood:	Unlikely	**Basis:** Likelihood has been reduced, but it remains unlikely.
Residual Consequence:	Marginal	**Basis:** In the worst case the solids build up limits the working space to such a degree that the blend tank must undergo a solids removal campaign. Prior to solids removal, a new blend tank must be readied, (to maintain feed preparation capabilities) and due to the reduction in blend tank capacity, the available feed rate drops to 6 Mgals/year as opposed to the required 9 Mgals/year. This is assumed to happen twice during the Program life with the solids removal campaign taking 12 months to complete. This incremental drop in processing throughput due to reduced feed availability could extend the Program up to 8 months. There will be an additional cost to ready an alternate blend tank, two times, (emptying tank and equipment modifications) of $15M per occurrence (assuming maximizing the re-use of equipment where applicable) and due to the reduction in blend tank capacity, the available feed rate drops to 6 Mgals/year as opposed to the required 9 Mgals/year.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	0	0	0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	232,000	232,000	463,000
Residual Schedule Impact :	4 Mths	4 Mths	8 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: Two solids removal campaigns are necessary with an impact of 8 mths to the Program plus cost to ready an alternate Blend Tank (twice) = $30M.

Most Likely and Best Case: A single solids removal campaign is required with an impact of 4 mths to the Program plus cost to ready an alternate Blend Tank (once) = $15M.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	232,000	232,000	463,000
Residual Schedule Impact :	4 Mths	4 Mths	8 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on risk having out-year consequences only.

Risk Assumptions :

31. Tank Farm feed preparation infrastructure modifications required to support SWPF processing rates including:

-H-Tank Farm Blend tanks readiness for salt solution preparation

-F-Tank Farm Blend tanks readiness for salt solution preparation

-Tank 49 readiness as SWPF feed tank

-Mixing capabilities

-Enhanced transfer capabilities

-Transfer routes provided to feed tank.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 363 **Revision:** 09 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Event Title: SDF Isopar Limits Restrict ARP/MCU Salt Processing Through Tank 50		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 4.1.1	**Assessable Element Title:** ARP/MCU Salt Processing	
WBS Number: 01.90.03	**WBS Title:** Waste Treatment	
Responsible Org: SRR-OPS	**Contact:** Brent Gifford	**Date Identified:** 3/23/2010

Statement of Event: SDF isopar limits in a non-ventilated mode (reduced from 87mg/L to 11mg/L) are lower than the design basis operating limits for ARP/MCU (50mg/L). A risk exists that accelerated salt processing at SDF results in the level of Tank 50 being reduced such that the isopar calculation determines aggregation of Tank 50 material will not meet the SDF limits for isopar and cannot be sent to SDF for processing.

Likelihood:	Very Likely	**Basis:** Previously production has been impacted in this way by the drawing down of Tank 50. This event has already been realized twice during recent operations. Designed and installed defense in depth features (e.g. redundant instrumentation, electronic instrument checks, electronic strip, scrub, solvent density/flow parameter checks etc.) in MCU. Performing quarterly solvent analysis and testing. Established a control chart (defines triggers for coalescer replacement). Implemented integrated batch strategy between ARP/MCU and SDF. With the lowering in the limit of isopar in the Tank 50/Saltstone WAC from 87mg/L to 11mg/L (non-ventilated mode) it is very likely that this event will occur.
Consequence / Benefit:	Negligible	**Basis:** In the worst case Tank 50 level is drawn down to such a low level that after receiving ARP/MCU DSS, it is determined the SDF limits cannot be met. ARP/MCU would cease operations and transfers to SDF would be suspended while Tank 50 is rebaselined and remediated (agitated to release isopar, aggregated etc.,). SDF processing is halted while tank contents are mixed and sampled. After continuous mixing and sampling eventually the isopar will be removed, the limit achieved, and processing restarted. In the worst case the schedule impact could be up to 1 month to ARP/MCU processing. Thiscould happen once per year for the remaining 4 years of production. Assuming ARP/MCU throughput of 1.5Mgals/yr this would be up to [1.5 x 4]/12 = 0.5Mgals] loss of salt production. This results in a cumulative delay to the Program of 0.5/9 yrs ~ 3 weeks).

Most Significant Cost Impact ($k): 37,500 **Most Significant Schedule Impact :** 3 wks

Level:	**Low**	**Event Trigger:** Currently open; Close upon the completion of ISDP operations.
Handling Strategy:	Mitigate	**Description:** Streamline administrative processes to isolate transfers from Tank 50 when material is determined not to meet SDF limits. Investigate raising organic limits in Saltstone through safety basis calculations. Investigate the use of temporary ventilation systems in SDUs. Perform a value Stream Analysis (VSA) Rapid Improvement Event (RIE), develop recommendations, issue report and implement recommendations of the VSA/RIE.

Handling Strategy Action Items:

363.1 Investigate raising organic limits in Saltstone through safety basis calculations., Thomas Huff

363.2 Investigate raising organic limits in Saltstone through use of temporary ventilation systems., Thomas Huff

363.3 Perform a value Stream Analysis (VSA) Rapid Improvement Event (RIE), develop recommendations and issue report., Brent Gifford

363.4 Implement recomendations of the VSA/RIE., Brent Gifford

HS Implementation Cost ($K):	0	**Basis:** No additional cost.
HS Implementation Schedule:	0	**Basis:** No impact to baseline schedule.

Other Handling Strategies: Perform modifications to allow a higher Isopar limit at SPF/SDF.

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Risk Assessment Form

ID Number: 363 **Revision:** 09 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Statement of Residual Risk: A risk remains that accelerated salt processing at SDF results in the level of Tank 50 being reduced such that aggregation of Tank 50 material will not meet the SDF limits for isopar and impacts ARP/MCU and SDF production.

Residual Likelihood:	Likely	**Basis:** With a raised limit and ventilation changes, the likelihood has been reduced.
Residual Consequence:	Negligible	**Basis:** In the worst case Tank 50 level is drawn down to such a low level that after receiving ARP/MCU DSS, it is determined the SDF limits cannot be met. ARP/MCU would cease operations and transfers to SDF would be suspended while Tank 50 is rebaselined and remediated (agitated to release isopar, aggregated etc.,). SDF processing is halted while tank contents are mixed and sampled. After continuous mixing and sampling eventually the isopar will be removed, the limit achieved, and processing restarted. In the worst case the schedule impact could be up to 1 month to ARP/MCU processing. Thiscould happen once per year for the remaining 4 years of production. Assuming ARP/MCU throughput of 1.5Mgals/yr this would be up to [1.5 x 4]/12 = 0.5Mgals] loss of salt production. This results in a cumulative delay to the Program of 0.5/9 yrs ~ 3 weeks).
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 25,000	**Worst Case** 37,500	Worst Case: A cumulative 3 week delay to Program. Most Likely Case: A cumulative 2 week delay to Program. Best Case: A cumulative 1 week delay to the Program.
Residual Schedule Impact :	1 Wks	2 Wks	3 wks	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 25,000	**Worst Case** 37,500	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	1 Wks	2 Wks	3 wks	

Risk Assumptions :

2. ARP/MCU:

-No major modifications to ARP/MCU will be implemented to increase processing capacity to over 3 million gallons per year. Modifications that may be made including upgrading ARP/MCU facilities as required to maintain the operating rate for the extended life.

-ARP/MCU facilities operate to ensure the total Interim Salt Treatment curies emplaced in SPF are within the amount identified in Savannah River Site – Liquid Waste Disposition Processing Strategy (SRS LW Strategy), as amended by letter from the South Carolina Department of Health and Environmental Control (SCDHEC) to DOE-SR and the Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site.

-A seven-month outage in FY17 is planned, coincident with a DWPF melter change-out. This outage will allow for ARP/MCU facility upgrades, which may include contactor bearings, weir adjustment, etc.

-Nominally ARP/MCU will produce:

- For each gallon processed, ~1.2 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 364 **Revision:** 07 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Event Title: SDUs are Not Available When Required (Project Execution Delays)			
Type: Risk, Internal, Technical	**Category:** Construction Strategy	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 5.1	**Assessable Element Title:** Grout Encapsulation of Waste		
WBS Number: 01.90.03.01	**WBS Title:** Saltstone Operations		
Responsible Org: SRR-PROJ	**Contact:** Jim Rugg	**Date Identified:** 5/26/2010	
Statement of Event: SDUs are to scheduled be constructed and made available to receive grout in support of the System Plan need dates. A risk exists that an SDU project execution is delayed and is not available when needed which results in halt to disposal of waste through SPF.			
Likelihood:	Unlikely	**Basis:** SDU 3/5 was delivered ahead of time. System Plan Revision 20 decreases SPF production in FY 14 through FY22. SDU 6 is required in FY18 and is current on track for FY17 startup. SDU 6 project maintains schedule contingency which is considered adequate to mitigate upsets during the remaining construction, testing and startup activities. The execution of future SDUs projects will be planned with sufficient schedule contingency to provide a high confidence level of on time delivery.	
Consequence / Benefit:	Marginal	**Basis:** As future SDUs will be planned closer to a "just in time" delivery, the worst case would be that an excessive number of major SDU project risks were fully realized on critical path activities and would consume the schedule contingency (currently set at 80% confidence level) and result in missing the need date for delivery. It is assumed that the worst case impact could be no geater than a 3 month delay. A 3 month delay in a future SDU which results in a shutdown of SWPF for the same duration would be a day for day impact to the Program (i.e. 3 months).	
Most Significant Cost Impact ($k): 163,000		**Most Significant Schedule Impact :** 3 Mths	
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion and turnover of last SDU.	
Handling Strategy:	Accept	**Description:** Acquisition of funding and initiation of SDU projects is the subject of DOE Risks 460 and 027 respectively, therefore the handling of this risk is limited to the project execution strategy. Currently, SDU construction complete and turnover to operations milestones will be scheduled with sufficient float to allow realization of most major project risks without impacting System Plan need dates by selecting an 80% confidence level for schedule contingency.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: Optimizing Cs throughput of ARP/MCU will extend the near-term availability of SDU space. This will happen by beneficially reusing the Decontaminated Salt Solution (DSS) stream that is collected in Tank 50 as a blending media for subsequent salt batches or for saltcake dissolution.			

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Risk Assessment Form

ID Number: 364 **Revision:** 07 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Statement of Residual Risk: A risk remains that an SDU project execution is delayed and is not available when needed which results in halt to disposal of waste through SPF.

Residual Likelihood:	Unlikely	**Basis:** SDU 3/5 was delivered ahead of time. System Plan Revision 20 decreases SPF production in FY 14 through FY22. SDU 6 is required in FY18 and is current on track for FY17 startup. SDU 6 project maintains schedule contingency which is considered adequate to mitigate upsets during the remaining construction, testing and startup activities. The execution of future SDUs projects will be planned with sufficient schedule contingency to provide a high confidence level of on time delivery.
Residual Consequence:	Marginal	**Basis:** As future SDUs will be planned closer to a "just in time" delivery, the worst case would be that an excessive number of major SDU project risks were fully realized on critical path activities and would consume the schedule contingency (currently set at 80% confidence level) and result in missing the need date for delivery. It is assumed that the worst case impact could be no geater than a 3 month delay. A 3 month delay in a future SDU which results in a shutdown of SWPF for the same duration would be a day for day impact to the Program (i.e. 3 months).
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 108,000	**Worst Case** 163,000	Worst Case: An SDU is delayed up to 3 months resulting in a 3 month delay to the Program.
Residual Schedule Impact :	1 Mth	2 Mths	3 Mths	Most Likely Case: An SDU is delayed up to 2 months resulting in a 2 month delay to the Program. Best Case: An SDU is delayed up to 1 month resulting in a 1 month delay to the Program.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 108,000	**Worst Case** 163,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	1 Mth	2 Mths	3 Mths	

Risk Assumptions :

18. During SWPF operation:

-SPF and SDF will support SWPF processing rates

-Additional operational time (i.e., multiple shifts, additional operating days each week, etc.) and adequate SDU receipt space to match production streams from SWPF are planned

-Modifications will provide sufficient contingency storage capacity to minimize impacts to SWPF or ETF due to SPF or SDF outages.

20. Three SDUs, SDU-2, SDU-3, and SDU-5 are in service. Neither Vault 1 or Vault 4 are planned to receive additional saltstone grout.

-Each gallon of DSS feed, when added to the cement, flyash, and slag, makes 1.76 gallons of grout

-SDU-2, SDU-3, and SDU-5 have two 150-foot diameter by 20-foot tall disposal cells. Each cell will contain ~2,300 kgal of grout. Therefore, each cell holds ~1,290 kgal of Tank 50 material feed solution; each SDU holds ~2,580 kgal of Tank 50 material feed solution

-SDU-6 through SDU-13, will be a single 375-foot diameter by 43-foot tall disposal cell which can contain 32 Mgal of grout. With the cold cap it will have a capacity of 30 Mgal of contaminated grout or 17.1 Mgal of Tank 50 material feed solution.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 366 **Revision:** 05 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: More Pu is Required to be Dispositioned in Sludge Batches (DOE Risk)			
Type: Risk, External, Programmatic	**Category:** Project Integration / Interfaces	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste		
WBS Number: 01.90.02.01	**WBS Title:** DWPF Operations		
Responsible Org: SRR-ENG	**Contact:** Richard Edwards	**Date Identified:** 10/6/2010	
Statement of Event: Currently Pu disposition is planned at a rate that will not challenge the 897g/m3 total fissile material limit, Federal Repository LA or impact the ability to produce canisters at 40% waste loading. A risk exists that DOE will direct additional Pu materials to SRS for disposition.			
Likelihood:	Likely	**Basis:** Planning scenarios are currently being performed which include a greater quantity of Pu for disposition. Sodium Reactor Experiment (SRE) waste is planned for inclusion into sludge batches 9 and 10.	
Consequence / Benefit:	Severe (Critical)	**Basis:** The worst case would impact the Program by forcing a lower contribution to canister waste loading from sludge and extending the sludge processing program. The end date for the Program would be extended. It is estimated that disposition of additional Pu could have up to a critical impact to the Program due to the life cycle extension. If this change were to be imposed on PBS-SR-0014, it would require a BCP to execute a contract baseline change and a System Plan revision would be required.	
Most Significant Cost Impact ($k): N/A		**Most Significant Schedule Impact :** N/A	
Level:	**High**	**Event Trigger:** DOE directs more Pu to be dispositioned in sludge batches. Currently open. Closed on end of program.	
Handling Strategy:	Avoid	**Description:** The disposition of additional Pu will be a System Plan change and the PBS baseline will undergo change control to include the additional scope which essentially avoids impact by triggering baseline change control. There is no residual risk or contribution to contingency from this risk.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** No additional cost.	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: None			

PBS SR-0014 **Risk Assessment Form**

ID Number: 366 **Revision:** 05 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: There is no residual risk or contribution to contingency from this risk.

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

6. DWPF canisters will maintain a concentration limit of 897 g/m3 of fissile material in the glass. Sludge batch preparation will supply feed for the DWPF to ensure the canisters remain within this requirement.

9. Pu discards from H-Canyon will be supported to the extent allowable without negatively impacting planned canister waste loadings while continuing to comply with the canister fissile material concentration limits.

Event Comments: This is an interface risk with the DOE Office(s) responsible for the Federal Repository Project and PBS-SR-0011/0012.

PBS SR-0014

Risk Assessment Form

ID Number: 388 **Revision:** 06 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Analytical Resource Limitations Prevent Meeting Baseline Schedule		
Type: Risk, External, Programmatic	**Category:** Resources/Conditions	**Group:** 4 - Out Year Risk, Risk Handling Strategy, and Consequences
Assessable Element : 6.0	**Assessable Element Title:** Closure (Tanks, Evap. & Ancil. Equip) Including Heel Removal	
WBS Number: 01.90.01	**WBS Title:** Waste Removal and Tank Closure	
Responsible Org: SRR-CL	**Contact:** Janice Williams	**Date Identified:** 1/10/2012

Statement of Event: Currently tank samples are analyzed by SRNL in the High Activity Cells. Outyear baseline schedule requires more samples to be analyzed in parallel than can currently be performed by SRNL. A risk exists that SRNL cannot increase capacity to analyze samples within cost and schedule constraints and meet the baseline for tank closure, salt batch qualification and/or sludge batch qualification.

Likelihood:	Likely	**Basis:** Current experience with sample analysis indicate that no more than two sample analyses can be completed in parallel. In the outyears more than two sample analyses are required to be completed in parallel.
Consequence / Benefit:	Severe (Critical)	**Basis:** The worst case would be in the outyears where more than two concurrent sampling and analysis activities could occur for non-compliant tanks. In this case up to four tanks could be delayed, each up to 12 months incurring additional costs for maintaining tanks of up to $4M (i.e. six concurrent sampling and analysis activities are required), however at this point, waste processing activities have ceased and the four year delay to the final closure of compliant tanks would only incurr the additional costs for those tanks. Delaying four tanks each for one year, could result in up to four years of delay to the final grouting and turnover to PBS-SR-0030.

Most Significant Cost Impact ($k): 4,000 **Most Significant Schedule Impact :** 4 years

Level:	**High**	**Event Trigger:** Open upon starting sample analysis of more than two tanks concurrently; Close upon completion of Program.
Handling Strategy:	Avoid	**Description:** Determine adequacy of existing SRNL capabilities and define requirements through approval of Liquid Waste Tank Residual (LWTR) Sampling Assurance Program Plan (SAPP) and LWTR Quality Assurance Program Plan (QAPP) (striving to align requirements with existing capabilities). Look for cost effective alternative to levelize the sample analysis need (e.g. SWPF, MOX). Develop through sample data (established in the earlier tank closures), a less extensive sampling requirement which eases the pressure on laboratories. Once the capability has been maximized, adjust the system plan to match the capability. This risk will be avoided once capability has been verified.

Handling Strategy Action Items:

388.4 Verify capability to perform sample analysis is available., To Be Assigned

HS Implementation Cost ($K):	0	**Basis:** No additional cost
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies: None

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Risk Assessment Form

ID Number: 388 **Revision:** 06 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: None, after System Plan is aligned to analytical capabilities, and capabilities have been verified, risk has been avoided.

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

27. A 30-month operational closure and stabilization process is assumed

-Drying & Sampling (6 months on critical path): including Tank Drying, Sample Prep Documents, Volume Determination Cessation Presentation and Sampling

-Sample Analysis (7 months on critical path): including Lab Analysis and Sample Analysis Report (SAR)

-Closure Documentation (14 months on critical path): including DQA, Inventory Determination, Special Analysis, MEP, Class C Calculation, Closure Module, and Tier 2

-Grouting (3 months on critical path)

Event Comments: This is an interface risk with PBS-SR-00030.

PBS SR-0014

Risk Assessment Form

ID Number: 390 **Revision:** 04 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Event Title: SDUs Not Available When Required (Operating Permit Delays)			
Type: Risk, External, Technical	**Category:** Regulatory and Environmental	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 5.1	**Assessable Element Title:** Grout Encapsulation of Waste		
WBS Number: 01.90.03.01	**WBS Title:** Saltstone Operations		
Responsible Org: SRR-ENV	**Contact:** Owen Stevens	**Date Identified:** 1/11/2012	
Statement of Event: Operating permits are issued by SCDHEC after construction and cold commissioning of SDUs. Project closeout and turnover to operations will follow shortly after a successful readiness assessment has been performed. A risk exists that although all these activities have occurred, SCDHEC has not yet issued an operations permit and the SDU is not available when required.			
Likelihood:	Unlikely	**Basis:** SCDHEC has issued a modification to the SDF Solid Waste Landfill Permit to allow SDU 2, 3&5, and 6 construction. SCDHEC monitored SDF SDU 2, 3&5 construction routinely and will inspect SDF SDU 6 prior to operation. This will be performed for all future SDUs. This event is therefore considered unlikely based on the close coordination between SCDHEC and SRR, however, exigent objections to permit issuance could arise internally within SCDHEC or externally from NRC recommendations (e.g. new information or challenge to an existing assumption used in the PA).	
Consequence / Benefit:	Marginal	**Basis:** The worst case would be an NRC objection occurring prior to permitting an SDU after SWPF has begun operations, which requires a formal and lengthy review process to document satisfactory resolution before SCDHEC is advised to issue an operating permit. Such a process could take up to 3 months. This could be a direct slip in the Program end date if the project had delivered just in time and SWPF were in full production.	
Most Significant Cost Impact ($k): 163,000		**Most Significant Schedule Impact :** 3 Months	
Level:	**Low**	**Event Trigger:** Open upon the turnover to operations of SDU2. Close upon turnover to operation of SDU 13.	
Handling Strategy:	Accept	**Description:** SRR works closely with SCDHEC and through DOE has a formalized process to respond to NRC questions and issues. There are no additional handling strategies that can be applied. Also utilizing lessons learned during the permitting of SDUs 2, 3 and 5.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 390 **Revision:** 04 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Statement of Residual Risk: A risk remains that SCDHEC has not yet issued an operations permit when the SDU is required.

Residual Likelihood:	Unlikely	**Basis:** This is unlikely based on the close coordination between SCDHEC and SRR, however, exigent objections to permit issuance could arise internally within SCDHEC or externally from NRC recommendations.
Residual Consequence:	Marginal	**Basis:** The worst case would be an NRC objection occurring prior to permitting an SDU after SWPF has begun operations, which requires a formal and lengthy review process to document satisfactory resolution before SCDHEC is advised to issue an operating permit. Such a process could take up to 3 months. This could be a direct slip in the Program end date if the project had delivered just in time and SWPF were in full production.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 54,000	**Worst Case** 163,000	Worst case: Program slip of 3 months while objections/issues are resolved and permit issued.
Residual Schedule Impact :	1 Wk	1 Mth	3 Mths	Most likely Case: Program slip of 1 month while SCDHEC issues are resolved. Best Case: Program slip of 1 week while SCDHEC issues are resolved.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 54,000	**Worst Case** 163,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	1 Wk	1 Mth	3 Mths	

Risk Assumptions :

18. During SWPF operation:

-SPF and SDF will support SWPF processing rates

-Additional operational time (i.e., multiple shifts, additional operating days each week, etc.) and adequate SDU receipt space to match production streams from SWPF are planned

-Modifications will provide sufficient contingency storage capacity to minimize impacts to SWPF or ETF due to SPF or SDF outages.

Event Comments:

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Risk Assessment Form

ID Number: 391 **Revision:** 08 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Federal Facilities Agreement and Site Treatment Plan Commitment Milestones Missed (DOE Risk)			
Type: Risk, Internal, Programmatic	**Category:** Regulatory and Environmental	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 6.0	**Assessable Element Title:** Closure (Tanks, Evap. & Ancil. Equip) Including Heel Removal		
WBS Number: 01.90.01	**WBS Title:** Waste Removal and Tank Closure		
Responsible Org: SRR-CL	**Contact:** Janice Williams	**Date Identified:** 1/12/2012	

Statement of Event: DOE has entered into a Federal Facilities Agreement (FFA) with the State of South Carolina and EPA. The FFA is legally binding and specifies penalties for failure to meet commitments within the agreement. Closure of tanks and bulk waste removal (BWRE) is specified within the FFA by tank type (compliant and non-compliant) and by milestone date. Failure to perform closure or BWRE on a tank or tanks by these milestones would be a violation of the FFA. However, extensions or deadlines shall be granted under criteria or procedures in the FFA. (Delay based on litigation risk is not calculated in this ROMP). System Plan 20 shows that of the 24 old-style tanks (types I, II and IV): 7 tanks are already closed; one is currently being grouted; the remaining 16 tanks will undergo closure after their FFA milestone dates; and 11 tanks will miss their associated BWRE milestone. A risk exists that due to realizing one or more of the risks relating to tank closure, (identified within this risk register), tank closure or BWRE milestones are further delayed past FFA milestones. A similar condition and risk exists for Site Treatment Plan milestones.

Likelihood:	N/A	**Basis:** The likelihood of missing an FFA tank closure /BWRE/STP milestone is directly tied to the major tank closure risks within this risk register and therefore is constantly subject to change. For this reason a specific likelihood is not provided. The major risks relating to tank closure are: Risk 011, Tank Farm Infrastructure/Equipment Failure Risk 027, Program (PBS-SR-0014) Funding Impacted By Competing Priorities Risk 090, Tank Farm Tank Availability and Infrastructure Does Not Support Salt Processing Operations Risk 174, Tank Cleaning Not Sufficient for Tank Closure Risk 205, SWPF Not Available When Planned Risk 267, Schedule For Complex Concurrent Activities Not Sustainable Risk 295, Tank Farm Transfer Line Failure Risk 346, Tank Closure Sampling Strategy is Not Effective Risk 299, Tank Leaks During Tank Cleaning Step
Consequence / Benefit:	Marginal	**Basis:** The worst case consequence of further delaying FFA/STP milestones is not readily quantifiable as in addition to the levied fines, the significance of further delaying FFA/STP milestone completion could have a negative influence on closure activities including closure funding, regulatory approvals and public opinion. However, assuming payment of fines by DOE will be external to Program funding, taking all factors into account, the impact on the Program may be negligible however, further delay in meeting FFA/STP commitments is considered an intolerable consequence to DOE. For purposes of assessing tangible impact (i.e. additional cost and schedule delay) to the Program an impact of Marginal has been selected by the team.
Most Significant Cost Impact ($k): N/A		**Most Significant Schedule Impact :** N/A
Level:		**Event Trigger:** Open upon first FFA Commitment; close on completion of last FFA closure milestone.
Handling Strategy:	Mitigate	**Description:** DOE-SR, with support from SRR, will continually prioritize work to help ensure remaining commitments are met. DOE-SR, supported by SRR will be proactive in negotiating changes to the FFA/STP for future milestones presently shown as being missed. DOE-SR will continue to work with DOE-HQ to stress the EM liabilities associated with failure to achieve FFA/STP milestones and emphasize the need for increased funding. Deploy TCCR to process salt waste up to SWPF operation startup.

Handling Strategy Action Items:

391.1 Deploy TCCR to process salt waste up to SWPF operation startup., Pen Mayson

HS Implementation Cost ($K):	0	**Basis:** No additional cost to Program.
HS Implementation Schedule:	0	**Basis:** No schedule impact to Program.
Other Handling Strategies: None		

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ID Number: 391 **Revision:** 08 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: N/A

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** N/A	**Most Likely** N/A	**Worst Case** N/A	N/A
Residual Schedule Impact :	N/A	N/A	N/A	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** N/A	**Most Likely** N/A	**Worst Case** N/A	N/A
Residual Schedule Impact :	N/A	N/A	N/A	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** N/A	**Most Likely** N/A	**Worst Case** N/A	N/A
Residual Schedule Impact :	N/A	N/A	N/A	

Risk Assumptions :

22. Types I, II, and IV tanks (Tanks 1–24):

-Waste Removal and Tank Removal from Service commitments are per the FFA

- Types I, II, and IV tanks (including Tanks 4, 7, 8, 11, and 21 through 24) may be used to optimize output of the Plan.

23. Type III and IIIA (Tanks 25–51):

-While the Type III and IIIA tanks are not included in the FFA, commitment for completion of waste removal (bulk waste and heel) from all tanks is per the STP

-Tanks are not required to be isolated and grouted to meet the STP

Event Comments:

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Risk Assessment Form

ID Number: 394 **Revision:** 04 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Event Title: New Waste Stream to Tank Farms (DOE Risk)			
Type: Risk, External, Technical	**Category:** Project Integration / Interfaces	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 1.0	**Assessable Element Title:** Receive Liquid Radioactive Waste		
WBS Number: 01.90.02.01	**WBS Title:** F-H Tank Farm Facilities		
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 1/19/2012	
Statement of Event: The System Plan is based upon the current waste inventory and identified influents from the Canyon. A risk exists that a new mission of the Canyon produces an entirely new waste stream (not simply a change to an existing flowsheet) for processing and stabilization.			
Likelihood:	Likely	**Basis:** Sodium Reactor waste was reviewed as a potential new waste stream to the Tank Farms. Impacts were assessed and accommodated for. It is likely that other new waste streams (e.g. graphite fuel, Pu) may also be generated if new Canyon missions are embarked upon.	
Consequence / Benefit:	Significant	**Basis:** The worst case cannot be bounded at this time. Sodium Reactor waste has been successfully accommodated in the HLW flowsheet, however as future new waste streams have not been identified or characterized, and for purposes of determining impact it cannot be assessed, it is assumed it would be of significant impact to the Program.	
Most Significant Cost Impact ($k): N/A	**Most Significant Schedule Impact :** N/A		
Level:	**Moderate**	**Event Trigger:**	
Handling Strategy:	Avoid	**Description:** The existing program has processes in place to evaluate new waste streams and downstream impacts to waste processing. The Liquid Waste program has a Memorandum of Understanding based agreement (FSA) and a baseline change may be required if a new waste stream were introduced.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 394 **Revision:** 04 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Statement of Residual Risk: Change control action will rebaseline Program. No residual impact.

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

30. Sufficient tank space volume is available to support the projected receipt of HLW into Tank 39 from H-Canyon operations through FY25. LLW waste, mainly from the General Purpose (GP) Evaporator, dispositioned in SPF are received into Tank 50 and direct discards of Pu and neptunium materials to the DWPF feed system are received into Tank 40, or Tank 51.

Event Comments: This is an interface risk with PBS-SR-00011/12.

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Risk Assessment Form

ID Number: 400 **Revision:** 05 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Single Source Supply Chains Fail to Deliver Materials/Equipment When Needed		
Type: Risk, External, Programmatic	**Category:** Resources/Conditions	**Group:** 4 - Out Year Risk, Risk Handling Strategy, and Consequences
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: SRR-PROC	**Contact:** David Seymour	**Date Identified:** 2/2/2012

Statement of Event: The life cycle of the System Plan includes deployment of new technologies, some of which rely on single source equipment providers, sole source development (technology base) and also single source specialized consumables. A risk exists that a single source is unable to provide equipment/technology or materials when required.

Likelihood:	Likely	**Basis:** At this time specialized technologies are not a major part of the Program. Suppliers of NQA-1 qualified vessels are becoming scarce. It is likely that these specialized vendors may not be readily available when needed. Also specialized materials are planned for use (e.g. Bob/Max Calix) and again it is considered likely that the single source vendor for these materials may not be readily available at that time. The conversion from blast furnaces to electric arc furnaces when combined with the shrinking US steel production base makes it likely that an issue could arise in obtaining slag in the outyears.
Consequence / Benefit:	Marginal	**Basis:** The worst case of a single source supply chain for special materials not being available or made available is not considered a credible risk. In these cases, a significant additional expenditure will be required to obtain these items. These costs are difficult to estimate, but assuming a single source such as slag is not available, the impact to avoid halting SPF operations, slag will be obtained from an alternate source at additional cost (e.g. transporting slag from overseas). This additional cost could be up to $30M per year over the life cycle of SPF (16 yrs Supporting SWPF production, after that production is minimal). $480M additional cost over the life cycle and no impact to schedule.

Most Significant Cost Impact ($k): 480,000 **Most Significant Schedule Impact :** 0

Level:	**Moderate**	**Event Trigger:** Currently open; Close upon completion of Program.
Handling Strategy:	Mitigate	**Description:** When developing technologies for deployment which use single source, exotic or specialty materials and/or equipment or rely upon single source/proprietary technology development, the potential for single source supply chain failures should be included. Development of backup technologies, alternate materials should be investigated to provide mitigation for these events. When deploying these technologies/processes, establish the ability to obtain spares, replenish materials, develop alternative sources, etc., sufficiently in advance to allow recovery should the single source chain fail.

Handling Strategy Action Items:

400.1 Perform evaluations to identify potential grout formulations which do not rely on the current fly ash/slag. (e.g. alternate to fly ash or higher ammonia contents)., Joel Cantrell, Completed, 1/27/2016

400.2 Identify alternatives to Halon (e.g. what has been substituted in the commercial world) and develop a path forward., Karen Lesko

400.3 Investigate the potential to identify and mature a backup vendor in the outyears for SWPF operation (Bob Calix and MST)., Pam Marks

HS Implementation Cost ($K):	0	**Basis:** No additional cost.
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies: None

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Risk Assessment Form

ID Number: 400 **Revision:** 05 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: If this risk occurs, the cost impact could not be avoided, but has been reduced by handling strategies.

Residual Likelihood:	Likely	**Basis:** At this time specialized technologies are not a major part of the Program. Other single sources such as fly ash/slag and halon may be commodities which are not in demand from the commercial industry and may become unavailable or are in short supply. Suppliers of NQA-1 qualified vessels are becoming scarce. It is likely that these specialized vendors may not be readily available when needed. Also specialized materials are planned for use (e.g. Bob/Max Calix) and again it is considered likely that the single source vendor for these materials may not be readily available at that time.
Residual Consequence:	Marginal	**Basis:** This additional cost could be up to $30M per year additionally over the life cycle of SPF (16 yrs Supporting SWPF production, after that production is minimal). $480M additional cost over the life cycle and no impact to schedule.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
	Best Case	**Most Likely**	**Worst Case**	N/A
Residual Cost Impact ($K):	0	0	0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
	Best Case	**Most Likely**	**Worst Case**	Worst Case: An additional cost of up to $480M to switch to an alternate vendor/material.
Residual Cost Impact ($K):	121,000	241,000	480,000	Most Likely Case: An additional cost to qualify a provider with a lower transportation cost. (Testing $1M and additional transportation cost resulting in life cycle increased cost of up to $240M)
Residual Schedule Impact :	0	0	0	Best Case: An additional cost to qualify a provider with a lower transportation cost. (Testing $1M and additional transportation cost resulting in life cycle increased cost of up to $120M)

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
	Best Case	**Most Likely**	**Worst Case**	Residual impact based on risk having out-year consequences only.
Residual Cost Impact ($K):	121,000	241,000	480,000	
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments:

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Risk Assessment Form

ID Number: 401 **Revision:** 04 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Exec. order (#13514) Requires Facilities Reduce Greenhouse Gases (DOE Risk)			
Type: Risk, External, Technical	**Category:** Regulatory and Environmental	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-ENV	**Contact:** Keith Liner	**Date Identified:** 2/2/2012	
Statement of Event: As SRS may be considered as one facility, new SRS facilities such as MOX and SWPF may add to total greenhouse emissions. A risk exists that this Executive Order may impact the balance of total emissions, thereby placing restrictions on new processes.			
Likelihood:	Non-Credible	**Basis:** The likelihood of this event impacting the Liquid Waste System Plan execution is considered not credible at this time as already existing facilities are minor contributors to overall emissions and no significant facility modifications or additions are planned which may exacerbate the potential for a problem.	
Consequence / Benefit:	Negligible	**Basis:** The consequences of this risk are limited to other facilities being deployed at SRS, e.g. MOX and future missions which is a cross-cutting risk.	
Most Significant Cost Impact ($k): 0		**Most Significant Schedule Impact :** 0	
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of Program.	
Handling Strategy:	Avoid	**Description:** It is not considered credible that this risk will impact the PBS-SR-0014 Program, however it may impact other activities at SRS. To avoid this risk entirely, it has been raised to a site level for handling.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 401 **Revision:** 04 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: There is no impact to the Program.

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments: This is a site-wide cross-cutting DOE risk and should be reviewed during the FRMP update.

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Risk Assessment Form

ID Number: 402 **Revision:** 04 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Beyond Current Design Basis Requirements Imposed (DOE Risk)			
Type: Risk, External, Technical	**Category:** Design	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: DOE-SR	**Contact:** Mark Smith	**Date Identified:** 2/6/2012	
Statement of Event: Currently DOE Orders and National Consensus Codes and Standards are used to establish a design basis and code of record for SRS SSCs. A risk exists that external influences result in a change to DOE Orders or National Consensus Codes and Standards.			
Likelihood:	Likely	**Basis:** It is likely that DOE Orders or National Consensus Codes and Standards may be revised as a result of the accidents resulting from recent greater than design basis events encountered at the Fukushima Dai-ichi facility in Japan. Currently, the Atomic Safety and Licensing Board has been petitioned to address the Fukushima Task Force report findings in the design of Vogtle Electric Generating Plant Units 3 and 4 (Docket Nos 52-025-COL & 26).	
Consequence / Benefit:	Negligible	**Basis:** It is not considered likely that the existing SSCs will undergo significant backfit to meet beyond design basis requirements. However, as a worst case impact, new facilities not yet deployed may have these additional requirements imposed upon them. New facilities are limited to SDUs and additional canister storage capacity. As the material at risk in the SDUs and additional canister storage capacity is minimal. The result would be an increased cost of design and construction of future facilities. This additional cost, while difficult to estimate, is considered to be no greater than $100M. There would be no Program delay.	
Most Significant Cost Impact ($k): 100,000		**Most Significant Schedule Impact :** 0	
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of Program.	
Handling Strategy:	Mitigate	**Description:** Beyond design basis evaluations have been performed for Tank Farms and are planned for DWPF. Minor DSA changes were implemented for the Tank Farm which increased the robustness of the saftey basis.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** Within the baseline.	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: None			

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ID Number: 402 **Revision:** 04 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: A risk remains that external influences result in a change to DOE Orders or National Consensus Codes and Standards.

Residual Likelihood:	Likely	**Basis:** It is likely that DOE Orders or National Consensus Codes and Standards may be revised as a result of the accidents resulting from recent greater than design basis events encountered at the Fukushima Dai-ichi facility in Japan. Currently, the Atomic Safety and Licensing Board has been petitioned to address the Fukushima Task Force report findings in the design of Vogtle Electric Generating Plant Units 3 and 4 (Docket Nos 52-025-COL & 26).
Residual Consequence:	Negligible	**Basis:** It is not considered likely that the existing SSCs will undergo significant backfit to meet beyond design basis requirements, as by proactively evaluating, identifying and implementing DSA changes to increase the robustnes of the safety basis, it is less likely imposed changes would have an impact. However, as a worst case impact, new facilities not yet deployed may have these additional requirements imposed upon them. New facilities are limited to SDUs and additional canister storage capacity. As the material at risk in the SDUs and additional canister storage capacity is minimal. The result would be an increased cost of design and construction of future facilities. This additional cost, while difficult to estimate, is considered to be no greater than $100M. There would be no Program delay.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 10,000	**Most Likely** 20,000	**Worst Case** 100,000	Worst Case: Additional costs of up to $100M to apply new design basis criteria to design to future projects. Most Likely Case: Additional costs of up to $20M to apply new design basis criteria to design to future projects.. Best Case: Additional costs of up to $10M to apply new design basis criteria to design to future projects.
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 10,000	**Most Likely** 20,000	**Worst Case** 100,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments: This is a cross-cutting risk which should be reviewed as part of the FRMP annual update.

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ID Number: 403 **Revision:** 04 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Tank 48 Processing Takes Longer than Planned			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 4 - Out Year Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 4.0	**Assessable Element Title:** Process Radioactive Waste		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 2/6/2012	
Statement of Event: Tank 48 processing is scheduled to begin in October 2024 and complete at the end of September 2026, per the LWO System plan (SRR-LWP-2009-00001, Rev. 20). The estimated processing time for the contents of the Tank 48 material is within this 24 month processing window. A risk exists that the process is slower than designed.			
Likelihood:	Likely	**Basis:** Currently the Chemical Destruction technology being considered for treatment of the Tank 48 material indicates that this process window is adequate. Research and development work at SRNL has been initiated, however, is not completed.	
Consequence / Benefit:	Negligible	**Basis:** Worst case would be that the Chemical Destruction requires an additional 2 years of operation to meet downstream (SWPF) requirements. There will be no impact to the Program as SWPF continued operation is planned through 2032. The impact would be limited to the additional cost of operating the Chemical Destruction process for an additional 2 years (at $10M/yr).	
Most Significant Cost Impact ($k): 20,000		**Most Significant Schedule Impact :** 0	
Level:	**Low**	**Event Trigger:** Open upon start of processing Tank 48 contents; Close upon completion of processing.	
Handling Strategy:	Accept	**Description:** Risk is accepted based on performing a technical maturation plan which provides acceptable assurance of operational parameters.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** No additional cost to Program.	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 403 **Revision:** 04 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: A risk remains that the process is slower than designed.

Residual Likelihood:	Likely	**Basis:** Currently the Chemical Destruction technology being considered for treatment of the Tank 48 material indicates that this process window is adequate. Research and development work at SRNL has been initiated, however, is not completed.
Residual Consequence:	Negligible	**Basis:** Worst case would be that the Chemical Destruction requires an additional 2 years of operation to meet downstream (SWPF) requirements. There will be no impact to the Program as SWPF continued operation is planned through 2032. The impact would be limited to the additional cost of operating the Chemical Destruction process for an additional 2 years (at $10M/yr).
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 5,000	**Most Likely** 10,000	**Worst Case** 20,000	Worst Case: Process requires an additional 2 years of operation ($20M). Most Likely Case: Process requires an additional 1 year of operation ($10M). Best Case: Process requires an additional 6 months of operation ($5M).
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 5,000	**Most Likely** 10,000	**Worst Case** 20,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments:

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ID Number: 405 **Revision:** 04 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Tank 48 Processing Creates a Waste Without an on Site Disposal Path		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 4 - Out Year Risk, Risk Handling Strategy, and Consequences
Assessable Element : 4.0	**Assessable Element Title:** Process Radioactive Waste	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 2/6/2012

Statement of Event: Tank 48 processing is scheduled to begin in October 2024 and complete at the end of September 2026, per the LWO System plan (SRR-LWP-2009-00001, Rev. 20). The resultant waste streams from the Chemical Destruction process will go to SWPF for final disposition in a salt batch(s). A risk exists that after deployment, the outgoing waste streams are not compatible with the planned disposal facilities.

Likelihood:	Unlikely	**Basis:** It is considered unlikely that the process would be deployed without a high confidence level of performing its function of meeting the SWPF WAC and processing control envelopes. After the Chemical Destruction research and development has been completed, it is planned to pursue downstream impact studies to ensure compatibility with planned disposal facilities. Additionally this material will be blended with the salt batch(s) for SWPF.
Consequence / Benefit:	Negligible	**Basis:** The worst case would be that the waste stream cannot be processed and will have to undergo further chemical destruction before blending into a salt batch(s). This will not impact the Program schedule as there is significant float until Tank 48 undergoes drying, sampling and closure. The additional cost of running the chemical destruction process for an additional year would be up to $10M.

Most Significant Cost Impact ($k): 10,000 **Most Significant Schedule Impact :** 0

Level:	**Low**	**Event Trigger:** Open upon start of processing Tank 48 contents; Close upon completion of processing.
Handling Strategy:	Mitigate	**Description:** This risk is mitigated by following the technical maturation process (flowsheet development, testing, and if necessary testing of product to qualify processing capability of downstream facilities e.g., ESS testing, glass formulation, grout) will ensure with reasonable certainty that outgoing waste stream will meet SWPF WAC.

Handling Strategy Action Items:

405.1 Ensure a comprehensive technical maturation process is performed (flowsheet development, testing, and if necessary testing of product to qualify processing capability of downstream facilities e.g., ESS testing, glass formulation, grout) to ensure with reasonable certainty that outgoing waste stream will meet SWPF WAC. This would be outlined in the Technology Maturation Plan., Richard Edwards

HS Implementation Cost ($K):	0	**Basis:** No additional cost.
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies: None

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ID Number: 405 **Revision:** 04 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: A risk remains that after deployment, the outgoing waste streams are not compatible with the planned disposal facilities.

Residual Likelihood:	Very Unlikely	**Basis:** It is considered very unlikely that the process will not perform its function of meeting the SWPF WAC and processing control envelopes after the Chemical Destruction research and development has been completed.
Residual Consequence:	Negligible	**Basis:** The worst case would be that the waste stream cannot be processed and will have to undergo further chemical destruction before blending into a salt batch(s). This will not impact the Program schedule as there is significant float until Tank 48 undergoes drying, sampling and closure. The additional cost of running the chemical destruction process for an additional year would be up to $10M.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	0	0	0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:
N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	2,500	5,000	10,000
Residual Schedule Impact :	0	0	0

Basis of OUT YEAR Cost and Schedule Impacts:
Worst Case: Process requires an additional 1 year of operation ($10M).
Most Likely Case: Process requires an additional 6 months of operation ($5M).
Best Case: Process requires an additional 3 months of operation ($2.5M).

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	2,500	5,000	10,000
Residual Schedule Impact :	0	0	0

Basis of LIFE CYCLE Cost and Schedule Impacts:
Residual impact based on risk having out-year consequences only.

Risk Assumptions :

Event Comments:

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Risk Assessment Form

ID Number: 414 **Revision:** 04 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Event Title: Higher Cs Waste in DWPF Prevents Equipment Contact Repair		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste	
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations	
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 2/14/2012

Statement of Event: Currently as DWPF equipment (e.g. process pumps, coils etc.) are removed for repair they can undergo decontamination and then repair by contact maintenance. A risk exists that when SWPF begins operation and high Cs strip effluent is being processed at DWPF in large volumes, equipment requiring repair cannot be decontaminated sufficiently to allow contact maintenance.

Likelihood:	Very Likely	**Basis:** Based on experience to date and the SWPF flowsheet.
Consequence / Benefit:	Significant	**Basis:** Currently 4 pumps per year are required to have contact maintenace repairs. The worst case would be that these pumps would have to be replaced. At a price of $1.5M per pump and an 18 month lead time on procurement. The impact to the Program would be 18 month downtime for the first occurrence and a cost of $6M per year over the life of DWPF after SWPF has begun operations (20 yrs) (=$120M).
Most Significant Cost Impact ($k): 1095,000		**Most Significant Schedule Impact :** 18 Mths
Level:	**High**	**Event Trigger:** Open on start of SWPF processing; Close upon completion of DWPF processing.
Handling Strategy:	Mitigate	**Description:** Design and procure an inventory of cheaper disposable pumps ("pump on a stick") prior to SWPF startup. Investigate and evaluate decontamination methods for use prior to SWPF startup.

Handling Strategy Action Items:

414.1 Design disposable pump ("pump on a stick")., Joel Cantrell

414.2 Procure an inventory of disposable pumps ("pump on a stick") prior to SWPF startup., Joel Cantrell

414.3 Investigate and evaluate decontamination methods for use prior to SWPF startup., Joel Cantrell

HS Implementation Cost ($K):	0	**Basis:** No additional cost.
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies: None

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ID Number: 414 **Revision:** 04 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Statement of Residual Risk: A risk remains that when SWPF begins operation and high Cs strip effluent is being processed at DWPF in large volumes, pumps requiring repair cannot be decontaminated sufficiently to allow contact maintenance.

Residual Likelihood:	Very Likely	**Basis:** Based on experience to date and the SWPF flowsheet.
Residual Consequence:	Negligible	**Basis:** The worst case has been reduced to the cost of replacement disposable pumps for the concurrent DWPF and SWPF outyear operating life of 20 years. Total cost = 20 x 4 x $100K = $8M.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 8,000	**Most Likely** 8,000	**Worst Case** 8,000	All Cases: Cost replacement disposable pumps for the concurrent DWPF and SWPF outyear operating life of 20 years. Total cost = 20 x 4 x $100K = $8M.
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 8,000	**Most Likely** 8,000	**Worst Case** 8,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

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Risk Assessment Form

ID Number: 415 **Revision:** 05 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Saltstone Disposal Facilities (SDF) Cannot Achieve Attainment		
Type: Risk, Internal, Technical	**Category:** Process Performance - Equip./Infrastr.Failures	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 5.1	**Assessable Element Title:** Grout Encapsulation of Waste	
WBS Number: 01.90.03.01	**WBS Title:** Saltstone Operations	
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 2/27/2012
Statement of Event: Saltstone Disposal Facilities (Saltstone Disposal Units [SDUs]) receive grout from the Saltstone Processing Facility (SPF) for final disposition. A risk exists that operational upset conditions result in grout placement activities being temporarily suspended.		

Likelihood:	Unlikely	**Basis:** The SDU projects review operational vulnerabilities as part of a comprehensive risk management process and develop risk handling strategies to avoid or mitigate these vulnerabilities within the design and/or operational procedures.
Consequence / Benefit:	Marginal	**Basis:** The worst case would be an operational upset, halting SDU operations while corrective action is performed (e.g. crack propagation in the SDU wall, unsatisfactory grout distribution, leaking of grout). These events could halt operations for up to six months while corrective action is performed.
Most Significant Cost Impact ($k): 325,000		**Most Significant Schedule Impact :** 6 Mths
Level:	**Low**	**Event Trigger:** Currently open: Close upon completion of program.
Handling Strategy:	Accept	**Description:** Working space will be monitored within Tank 50/SSRTs and integrated with SPF runs to maximize the available space, should an upset condition occur. This risk has been accepted for SDU 6 operation.
Handling Strategy Action Items:		
HS Implementation Cost ($K):	0	**Basis:** No additional cost.
HS Implementation Schedule:	0	**Basis:** No impact to schedule.
Other Handling Strategies: Risk could be avoided in SDU 7 and onwards if SDU 7 and SDU 8 projects are started concurrently.		

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ID Number: 415 **Revision:** 05 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: A risk exists that operational upset conditions result in grout placement activities being temporarily suspended.

Residual Likelihood:	Unlikely	**Basis:** The SDU projects review operational vulnerabilities as part of a comprehensive risk management process and develop risk handling strategies to avoid or mitigate these vulnerabilities within the design and/or operational procedures.
Residual Consequence:	Marginal	**Basis:** The worst case would be an operational upset, halting SDU operations while corrective action is performed (e.g. crack propagation in the SDU wall, unsatisfactory grout distribution, leaking of grout). These events could halt operations for up to six months while corrective action is performed.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	0	0	0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	54,000	163,000	325,000
Residual Schedule Impact :	1 Mth	3 Mths	6 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: Operational upset, halting SDU operations for up to 6 months while corrective action is performed.

Most Likely Case: Operational upset, halting SDU operations for up to 3 months while corrective action is performed.

Best Case: Operational upset, halting SDU operations for up to 1 month while corrective action is performed.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	54,000	163,000	325,000
Residual Schedule Impact :	1 Mth	3 Mths	6 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on risk having out-year consequences only.

Risk Assumptions :

18. During SWPF operation:

-SPF and SDF will support SWPF processing rates

-Additional operational time (i.e., multiple shifts, additional operating days each week, etc.) and adequate SDU receipt space to match production streams from SWPF are planned

-Modifications will provide sufficient contingency storage capacity to minimize impacts to SWPF or ETF due to SPF or SDF outages.

Event Comments:

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Risk Assessment Form

ID Number: 417 **Revision:** 04 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Replacement Melter(s) Damaged During Storage/Assembly		
Type: Risk, Internal, Technical	**Category:** Process Performance - Equip./Infrastr.Failures	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 4.2	**Assessable Element Title:** Sludge Processing	
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations	
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 1/8/2013

Statement of Event: Currently, both the Melter that is staged as a replacement for the operating Melter and the next replacement (being assembled) are housed in the same building (Melter 3 and Melter 4 in Building 717-F). A risk exists that an event (building fire, natural phenomena, security) results in damage to one or both melters.

Likelihood:	Very Unlikely	**Basis:** Building 717-F is required to meet site fire protection, design and security requirements. The site requirements are designed to reduce the likelihood of impact from these types of event. The fire frequency for all SRS facilities is low, but the risk of fire exists, and a fire event, in this case, has the potential for causing significant damage.
Consequence / Benefit:	Very Severe (Crisis)	**Basis:** In the worst case, an event (e.g. fire, natural phenomena) results in the irreparable damage to the spare melter and second melter being assembled in 717-F close to the time the operational melter is to be replaced. With no available spare melter, DWPF would be forced into a shut down until a new Melter is fabricated and assembled. Even on an expedited schedule, this could not likely be accomplished in under three years. (currently 4 years is the standard duration for a melter replacement project). A direct schedule delay to the Program of 3 years would be incurred ($1,950M) and an additional cost of up to $20M to expedite the Melter procurement.

Most Significant Cost Impact ($k): 1,970,000 **Most Significant Schedule Impact :** 3 Yrs

Level:	**High**	**Event Trigger:** Open upon Melter 4 relocation to 717-F; Close upon completion of Program.
Handling Strategy:	Mitigate	**Description:** Maintain the current strategy of storing two Melters in the same building so as not to impact DWPF production while investigating and then implementing a storage strategy where both Melters are separated such that no single fire or NPH event can significantly damage both. Add Melter security as a specific item in the interface agreement with the M&O.

Handling Strategy Action Items:

417.2 Implement recommended storage strategy (Construct a Spare Melter Storage Building)., Joel Cantrell

HS Implementation Cost ($K):	0	**Basis:** Currently planned (however funding is a constraint).
HS Implementation Schedule:	0	**Basis:** No schedule impact to Program.

Other Handling Strategies: None

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ID Number: 417 **Revision:** 04 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: With the implementation of risk handling strategies, this risk will have driven down the likelihood to an acceptable level and any consequences down to a negligible impact.

Residual Likelihood:	Very Unlikely	**Basis:** Separation of melters reduces the risk of both melters being damaged.
Residual Consequence:	Significant	**Basis:** Worst case would be losing the Melter which is ready for replacement (Melter 3) and having to expedite the readiness of Melter 4. Melter 4 could take up to 1 year. The cost of replacing the lost melter would be $45M.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 5,000	**Most Likely** 12,000	**Worst Case** 45,000
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

Worst Case: Damage cannot be repaired to one of the melters. $45M cost of replacement.

Most Likely Case: Damage can be repaired without impacting DWPF production at a cost of up to $2M and $10M.

Best Case: Damage can be repaired without impacting DWPF production at a cost of up to $5M.

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 650,000
Residual Schedule Impact :	0	0	1 Yr

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case only: 1 year impact to Program.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 5,000	**Most Likely** 12,000	**Worst Case** 695,000
Residual Schedule Impact :	0	0	1 Yr

Basis of LIFE CYCLE Cost and Schedule Impacts:

Impact based on Near-term and outyear consequences only.

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

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Risk Assessment Form

ID Number: 418 **Revision:** 04 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: DOE Requires USQE to be Performed on all Modifications (DOE Risk)			
Type: Risk, External, Technical	**Category:** Safety	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-ENG	**Contact:** Thomas Huff	**Date Identified:** 4/2/2013	
Statement of Event: DOE has directed a revision to 11Q Procedure 1.05 that eliminates the ability to perform USQ screenings on physical modifications resulting in the requirement that a USQE be performed on all physical modifications. A risk exists that the consequences of this change may impact Program execution.			
Likelihood:	Very Likely	**Basis:** This change has been directed. DOE requested and received a ROM cost estimate in 2013 and will receive an additional impact evaluation in 2015.	
Consequence / Benefit:	Negligible	**Basis:** In the worst case, an additional cost of $3M will be incurred for the first year, $1.3M for subsequent 3 years and $1M $1M/year (20 yrs).	
Most Significant Cost Impact ($k): 26,900		**Most Significant Schedule Impact :** 0	
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of Program.	
Handling Strategy:	Mitigate	**Description:** Work with DOE and SRNS to minimize potential impacts.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** No additional cost.	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: None			

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ID Number: 418 **Revision:** 04 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: A risk remains that the consequences of this change may impact Program execution.

Residual Likelihood:	Very Likely	**Basis:** Likelihood may have been reduced, yet remains very likely.	
Residual Consequence:	Negligible	**Basis:** In the worst case, an additional cost of $3M will be incurred for the first year, $1.3M for subsequent 3 years and $1M $1M/year (20 yrs).	
Residual Risk Level:	**Low**		

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 7,900	**Most Likely** 7,900	**Worst Case** 7,900	All cases: Near term cost of $7.9M.
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 19,000	**Most Likely** 19,000	**Worst Case** 19,000	All cases: Outyear cost of $19M.
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 26,900	**Most Likely** 26,900	**Worst Case** 26,900	Residual impact based on total life cycle.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 420 **Revision:** 04 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Event Title: Saltstone Grout Pump Cannot Deliver Grout to SDUs			
Type: Risk, Internal, Technical	**Category:** Project Integration / Interfaces	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 5.1	**Assessable Element Title:** Grout Encapsulation of Waste		
WBS Number: 01.90.03.01	**WBS Title:** Saltstone Operations		
Responsible Org: SRR-ENG	**Contact:** Eric Freed	**Date Identified:** 4/4/2013	
Statement of Event: Saltstone Facility will pump grout to the SDUs for placement. A risk exists that when an SDU becomes operational it is discovered that the SPF grout pump will not be able to deliver grout to the SDU due to lack of capacity.			
Likelihood:	Unlikely	**Basis:** The original SPF grout pump was determined to have marginal capacity to deliver grout successfully to SDU 3/5. A higher capacity grout pump has been installed and demonstrated capable to reach SDU 3/5 and SDU 6 with operating margin.	
Consequence / Benefit:	Marginal	**Basis:** The worst case would be that the lack of grout pump capacity is discovered immediately prior to initiating operations (i.e. "just in time" operation of the SDU). This would result in an impact of up to 6 months to SPF/SDF operations during which no grout could be poured once available lag capacity has been exceeded. Additional costs of up to $1M could be incurred to install a more powerful booster pump/system.	
Most Significant Cost Impact ($k): 326,000		**Most Significant Schedule Impact :** 6 Mths	
Level:	**Low**	**Event Trigger:** Open upon start of SDU 6 operations; Close upon successful start to last SDU operations.	
Handling Strategy:	Avoid	**Description:** Investigate the grout delivery system to each SDU and ensure the design has sufficient capacity to pump grout to the final disposition point. Include necessary modifications in each SDU project to ensure the field deployment is successful. Develop a System Plan with sufficient contingency space available in previous SDU to avoid "just in time" delivery of disposal facilities.	
Handling Strategy Action Items: 420.1 Formally review the pressure needed to process to SDU 6 and validate system capacity., Noel Chapman 420.2 Formally review the pressure needed to process to SDU 7 and validate system capacity., Noel Chapman			
HS Implementation Cost ($K):	0	**Basis:** No additional cost to Program	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: None			

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ID Number: 420 **Revision:** 04 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Statement of Residual Risk: No residual risk. This risk has been avoided.

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:** N/A
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:** N/A
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:** N/A
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

18. During SWPF operation:

-SPF and SDF will support SWPF processing rates

-Additional operational time (i.e., multiple shifts, additional operating days each week, etc.) and adequate SDU receipt space to match production streams from SWPF are planned

-Modifications will provide sufficient contingency storage capacity to minimize impacts to SWPF or ETF due to SPF or SDF outages.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 421 **Revision:** 02 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Glass Waste Storage is not Available After GWSB #2 is Filled (DOE Risk)			
Type: Risk, Internal, Technical	**Category:** Project Integration / Interfaces	**Group:** 3 - Out Year Risk and Consequences, with Near Term Risk Handling Strategy	
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste		
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations		
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 4/4/2013	
Statement of Event: An additional storage capacity is being performed by double stacking canisters. After GWSB #2 has been filled with DWPF canisters, an additional storage capacity is required. It is currently planned to provide this additional glass waste storage capacity to be available by October 2028. A risk exists that this capacity is not provided in time to meet the System Plan needs.			
Likelihood:	Unlikely	**Basis:** The project to provide this storage capacity is a DOE managed contract which will have to begin in 2026 to be in time to meet System Plan demand. It has been determined this will be a line item. Approval of line item funding must be early enough to support a project start in time to deliver the additional capacity by November 2028.	
Consequence / Benefit:	Marginal	**Basis:** The worst case delay, starting the project 1 year later than planned due to delay in funding approval would result in a direct impact to the Program of 6 months (this assumes project acceleration as far as practical). DWPF canister production will cease once GWSB #2 is full.	
Most Significant Cost Impact ($k): 325,000		**Most Significant Schedule Impact :** 6 Mths	
Level:	**Low**	**Event Trigger:** Open upon reaching project start date; Close upon providing adequate interim storage capacity.	
Handling Strategy:	Avoid	**Description:** The System Plan has projected a reduced canister production to already minimize the impact of this event. Additionally, to avoid this risk, investigate alternate storage (e.g. double stacking, interim storage options), develop a strategy and deploy to avoid this impact.	
Handling Strategy Action Items: 421.2 Develop a strategy (conceptual design and implementation plan) to provide supplemental storage beyond the point at which double stack space is no longer available., Pen Mayson			
HS Implementation Cost ($K):	0	**Basis:** Within planned baseline for outyears.	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: None			

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ID Number: 421 **Revision:** 02 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: Risk has been avoided.

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:** N/A
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:** N/A
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:** N/A
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

Risk Assumptions : 15. GWSB #1 will be converted to allow stacking two canisters in each currently available storage position and additional canister storage capacity will be available, as necessary, after the GWSB #2 and the stacked GWSB #1 are filled.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 422 **Revision:** 03 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Event Title: Organic Carryover in ISDP Waste to DWPF			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1.1	**Assessable Element Title:** ARP/MCU Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-OPS	**Contact:** Brent Gifford	**Date Identified:** 4/10/2013	
Statement of Event: The Caustic Side Solvent Extraction process at MCU can encounter process upsets and transients. A risk exists that a process upset or transient results in elevated levels of organic carryover in strip effluent up to or exceeding DWPF WAC limits.			
Likelihood:	Unlikely	**Basis:** Process upset/transients have occurred due to sampler cross-contamination and de-inventorying of the SE decanter (prior to an outage). Both of these are understood and mitigative actions and controls are in place to prevent recurrence (e.g. independent sampling system has been installed). Not all operational transients will result in elevated carryover to strip effluent beyond the DWPF WAC limits.	
Consequence / Benefit:	Negligible	**Basis:** An elevated organic carryover to the strip effluent stream would be detected in sampling after transfer to DWPF. The chemistry would be corrected through processing adjustments at DWPF and ARP/MCU operations would be slowed down to perform a sample and hold process until process adjustments can correct the issue or a temporary hold while DWPF dispositions the SE material. Exceeding DWPF WAC limits could result in up to 1 month delay to ISDP operation. Elevated isopar levels which come close to the WAC limit without exceeding, yet force high Isopar operation mode could, cumulatively over the life of ARP/MCU operations (assuming one event per year), result in a total delay of up to 6 weeks (3yrs production) could be realized. This would be a 6 x 1.5/9 weeks impact to the Program (1 week).	
Most Significant Cost Impact ($k): 12,500		**Most Significant Schedule Impact :** 1 Wk	
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of ARP/MCU processing.	
Handling Strategy:	Mitigate	**Description:** Perform a VSA / RIE and implement appropriate recommendations.	
Handling Strategy Action Items: 422.1 Perform a value Stream Analysis (VSA) and Rapid Improvement Event (RIE) on this process, develop recommendations and issue reports., Brent Gifford 422.2 Implement recommendations of VSA/RIE reports., Brent Gifford			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 422 **Revision:** 03 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Statement of Residual Risk: A risk remains that a process upset or transient results in elevated levels of organic carryover in strip effluent.

Residual Likelihood:	Very Unlikely	**Basis:** Likelihood has been reduced by implementation of the recommendations of the RIE.
Residual Consequence:	Negligible	**Basis:** An elevated organic carryover to the strip effluent stream would be detected in sampling after transfer to DWPF. The chemistry would be corrected through processing adjustments at DWPF and ARP/MCU operations would be slowed down to perform a sample and hold process until process adjustments can correct the issue or a temporary hold while DWPF dispositions the SE material. Exceeding DWPF WAC limits could result in up to 1 month delay to ISDP operation. Elevated isopar levels which come close to the WAC limit without exceeding, yet force high Isopar operation mode could, cumulatively over the life of ARP/MCU operations (assuming one event per year), result in a total delay of up to 6 weeks (3yrs production) could be realized. This would be a 6 x 1.5/9 weeks impact to the Program (1 week).
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 12,500	**Worst Case** 12,500	Worst Case, Most Likely Case and Best Case: A cumulative 1 week delay to Program.
Residual Schedule Impact :	1 Wk	1 Wk	1 Wk	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 12,500	**Worst Case** 12,500	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	1 Wk	1 Wk	1 Wk	

Risk Assumptions :

2. ARP/MCU:

-No major modifications to ARP/MCU will be implemented to increase processing capacity to over 3 million gallons per year. Modifications that may be made including upgrading ARP/MCU facilities as required to maintain the operating rate for the extended life.

-ARP/MCU facilities operate to ensure the total Interim Salt Treatment curies emplaced in SPF are within the amount identified in Savannah River Site – Liquid Waste Disposition Processing Strategy (SRS LW Strategy), as amended by letter from the South Carolina Department of Health and Environmental Control (SCDHEC) to DOE-SR and the Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site.

-A seven-month outage in FY17 is planned, coincident with a DWPF melter change-out. This outage will allow for ARP/MCU facility upgrades, which may include contactor bearings, weir adjustment, etc.

-Nominally ARP/MCU will produce:

- For each gallon processed, ~1.2 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Event Comments:

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Risk Assessment Form

ID Number: 424 **Revision:** 03 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Event Title: Salt Processing Limited by Actinide Removal Capacity			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1.1	**Assessable Element Title:** ARP/MCU Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 5/1/2013	

Statement of Event: The ARP filtration process is assumed to be capable of sustaining filtration throughput to support the planned MCU salt processing rate while operating at a capacity of up to 3 Mgals/year. A risk exists that after improving the filtration process as planned (e.g. replacing cross-flow filter [differing size, clean]), filtration cannot support the maximum throughput requirement.

Likelihood:	Unlikely	**Basis:** Attainment impacts to date while using MST show filtration is a choke point.
Consequence / Benefit:	Negligible	**Basis:** In the worst case the filtration improvements do not significantly increase the capabilities and this results in ARP process being unable to support a maximum throughput of up to 3 Mgals/yr. This results in the the planned 1.5Mgals per year salt processing being reduced to 1Mgals per year. In the two years prior to SWPF being brought on line, approximately 1Mgal of salt processing is not achieved. This results in a program delay of approx. 1/9 years (~ 6 weeks).

Most Significant Cost Impact ($k): 75,000 **Most Significant Schedule Impact :** 6 Wks

Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of actinide processing for ARP/MCU operation.
Handling Strategy:	Mitigate	**Description:** Established a Filter Improvement Team (FIT) that identified methods to improve filtration capability. Evaluate salt processing integrated flowsheet and identify improvements. Task Salt IPT to identify ARP/MCU improvements to meet 3 Mgals/yr. Install the new design filter if increased throughput is not realized. Continue processing without MST addition and evaluate performance. Further investigate processing without MST and without filtration.

Handling Strategy Action Items:

424.4 Investigate processing without MST and with settle/decant in lieu of filtration and issue report with recommendations., Richard Edwards

424.5 Evaluate data obtained from no MST operation for overall throughput improvement to Program and issue report with recommendations., Ryan McNew

424.6 Evaluate near-term filter performance and issue recommendation on proceding with the installation of the new design filter., Eric Freed

HS Implementation Cost ($K):	0	**Basis:** FIT/IPT modifications to implement recommendations are generally funded. Additional recommendation for disassembly and filter testing at SRNL is planned, but not currently funded.
HS Implementation Schedule:	0	**Basis:** No impact to schedule.

Other Handling Strategies: None

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Risk Assessment Form

ID Number: 424 **Revision:** 03 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Statement of Residual Risk: A risk exists that after improving filtration process as planned, actinide removal cannot support the maximum throughput requirement.

Residual Likelihood:	Very Unlikely	**Basis:** Likelihood has been reduced by implementing recommendations.
Residual Consequence:	Negligible	**Basis:** In the worst case the filtration improvements do not significantly increase the capabilities and this results in ARP process being unable to support a maximum throughput of up to 3 Mgals/yr. This results in the the planned 1.5Mgals per year salt processing being reduced to 1Mgals per year. In the two years prior to SWPF being brought on line, approximately 1Mgal of salt processing is not achieved. This results in a program delay of approx. 1/9 years (~ 6 weeks).
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 37,500	**Worst Case** 75,000	Worst Case: 1 Mgals of salt processing is not achieved resulting in a 6 Wk delay. Most Likely Case: 0.5 Mgals of salt processing is not achieved resulting in a 3 week delay. Best Case: 0.25 Mgals of salt processing is not achieved resulting in a 1 week delay.
Residual Schedule Impact :	1 Wk	3 Wks	6 Wks	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 37,500	**Worst Case** 75,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	1 Wk	3 Wks	6 Wks	

Risk Assumptions :

2. ARP/MCU:

-No major modifications to ARP/MCU will be implemented to increase processing capacity to over 3 million gallons per year. Modifications that may be made including upgrading ARP/MCU facilities as required to maintain the operating rate for the extended life.

-ARP/MCU facilities operate to ensure the total Interim Salt Treatment curies emplaced in SPF are within the amount identified in Savannah River Site – Liquid Waste Disposition Processing Strategy (SRS LW Strategy), as amended by letter from the South Carolina Department of Health and Environmental Control (SCDHEC) to DOE-SR and the Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site.

-A seven-month outage in FY17 is planned, coincident with a DWPF melter change-out. This outage will allow for ARP/MCU facility upgrades, which may include contactor bearings, weir adjustment, etc.

-Nominally ARP/MCU will produce:

- For each gallon processed, ~1.2 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 426 **Revision:** 03 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Acidic Chemical Cleaning is Required on Non-Sludge Solids Tanks			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 3 - Out Year Risk and Consequences, with Near Term Risk Handling Strategy	
Assessable Element : 6.0	**Assessable Element Title:** Closure (Tanks, Evap. & Ancil. Equip) Including Heel Removal		
WBS Number: 01.90.01	**WBS Title:** Waste Removal and Tank Closure		
Responsible Org: SRR-CL	**Contact:** Janice Williams	**Date Identified:** 5/8/2013	
Statement of Event: System Plan 20 assumes that other than the source tanks for sludge solids, acidic chemical cleaning will not be required prior to closure. A risk exists that mechanical cleaning (mixing) alone is not sufficient, and some of these tanks require acidic chemical cleaning.			
Likelihood:	Unlikely	**Basis:** Acidic chemical cleaning has not indicated significant advantages over simply extending mechanical cleaning campaigns.	
Consequence / Benefit:	Negligible	**Basis:** In the worst case up to 10 tanks are required to be chemically cleaned. This results in an additional cost of $5M per tank and an unknown number of additional DWPF canisters. As tank closure is not on critical path for program completion until BWR on the last tank has been completed, no Program delay is expected.	
Most Significant Cost Impact ($k): 50,000		**Most Significant Schedule Impact :** 0	
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of Program.	
Handling Strategy:	Mitigate	**Description:** Develop a position on the effectiveness of acidic chemical cleaning with respect to mechanical cleaning. Use this position to minimize the number of source tanks for sludge solids tanks that would have to undergo chemical cleaning as opposed to extended mechanical cleaning should issues arise with meeting tank cleanliness requirements.	
Handling Strategy Action Items: 426.1 Evaluate the effectiveness of acidic chemical cleaning Vs the benefit with respect to system plan impacts based on experience and data gained. Issue report with recommendations for including in the System Plan., Ryan McNew			
HS Implementation Cost ($K):	0	**Basis:** Included in the current baseline.	
HS Implementation Schedule:	0	**Basis:** No impact to schedule.	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 426 **Revision:** 03 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: A risk remains that mechanical cleaning alone is not sufficient, and some tanks require additional chemical cleaning.

Residual Likelihood:	Unlikely	**Basis:** Acidic chemical cleaning has not indicated significant advantages over simply extending mechanical cleaning campaigns.
Residual Consequence:	Negligible	**Basis:** Developing an engineering position allows a reduction in the number of tanks requiring chemical cleaning to 6 should this risk be realized. This results in an additional cost of $5M per tank. As tank closure is not on critical path for program completion until BWR on the last tank has been completed, no Program delay is expected.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 5,000	**Most Likely** 15,000	**Worst Case** 30,000	Worst Case: Six tanks require chemical cleaning at a cost of $5M each. Most Likely Case: Three tanks require chemical cleaning at a cost of $5M each. Best Case: One tank requires extended mechanical cleaning. Estimated at $5M.
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 5,000	**Most Likely** 15,000	**Worst Case** 30,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

25. Two Phases of Waste Heel Removal are available for use:

-Mechanical Cleaning uses mechanical agitation

- Assumed to take three months of operation unless otherwise stated
- Heel solids volume reduced to less than 5 kgal

-If needed, Chemical Cleaning uses LTAD, OA or advanced/specialized mechanical or chemical technology

- Assumed to take three months of operation unless otherwise stated

-For some tanks with high waste turnover, e.g. Tank 8, mechanical cleaning may not be required; however, flushing could be required prior to chemical cleaning

-This Plan assumes Tanks 4, 7, 8, 11, 13, 14, 15, 26, 32, 33, 34, 35, 39, 42, 43, 47 are the sludge tanks that have chemical cleaning. No other tanks are planned for chemical cleaning. These tanks will be sampled and analyzed after BWRE complete to determine the amount of chemical cleaning necessary.

-Monitoring during heel removal will inform the decision to do mechanical or chemical cleaning.

Event Comments: This is an interface risk with the DOE Office(s) responsible for the Federal Repository Project. Note: Tank 1 has a prohibition on acid cleaning.

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Risk Assessment Form

ID Number: 427 **Revision:** 03 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Event Title: DWPF Recycle Contains High Proportion of Solids		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 3.0	**Assessable Element Title:** Concentrate Liquid Radioactive Waste	
WBS Number: 01.90.02.01	**WBS Title:** F-H Tank Farm Facilities	
Responsible Org: SRR-ENG	**Contact:** Ryan McNew	**Date Identified:** 5/16/2013

Statement of Event: DWPF Recycle will be received in Tank 22 and also used for salt dissolution. A risk exists that the amount of solids carryover from DWPF becomes continually higher than anticipated. This impacts the ability to transfer recycle to the Tank Farms.

Likelihood:	Unlikely	**Basis:** Recently DWPF recycle has shown to exhibit a higher than anticipated content of solids. As yet this has not been evaluated for impact to the system. Recent production process changes have reduced the amount of carryover. When SWPF is in full production, this risk may be exacerbated.
Consequence / Benefit:	Very Severe (Crisis)	**Basis:** Having to allow settling in Tank 22 and being unable to directly use DWPF recycle for salt dissolution will result in having insufficient space to continue receipt of DWPF recycle. The consequences could be up to a 1 month break in DWPF receipts for recycle settling to occur in Tank 22 prior to being able to use the contents for salt dissolution and/or evaporator feed. After settling, the use of material from Tank 22 is limited by evaporator feed tank constraints and flammability concerns in the salt dissolution tank and therefore can only be used at a limited rate. Additionally, the impact of the accumulation of solids in the salt dissolution tank may result in inefficient salt dissolution. Assuming 2 months for emptying Tank 22, the the impact to the Program would be a reduction in overall attainment of 25%. The Program impact could be up to 4 years (110Mgals of salt processed at 25% less attainment).

Most Significant Cost Impact ($k): 2,600,000	**Most Significant Schedule Impact :** 4 Yrs

Level:	**High**	**Event Trigger:** Currently open; Close upon completion of processing.
Handling Strategy:	Mitigate	**Description:** Use of alternate reductant will result in the use of less antifoam and potentially reduce solids carryover in DWPF recycle stream. Use of Dry Frit will greatly reduce the volume of DWPF recycle. Identify multiple receipt tanks for receiving DWPF recycle. Implement a sampling strategy at DWPF to reduce flammability impacts associated with the solids carryover by determining what portion of the solids are sludge are which are non-heat bearing solids (e.g., frit).

Handling Strategy Action Items:

427.2 Identify multiple receipt tanks for receiving DWPF recycle., Jeff Leita

427.3 Investigate the deployment of Gas Release Modification on the salt dissolution tanks to mitigate the flammability concerns during salt dissolution., Jeff Leita

HS Implementation Cost ($K):	0	**Basis:** No additional cost.
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies: Accelerate the deployment of a unit operation to handle DWPF recycle stream such that receipt of DWPF recycle by the Tank Farm is curtailed earlier. Gas Release Modification on the salt dissolution tanks is not currently within the cost baseline. Cost to investigate and deploy unit operation to avoid sending DWPF recycle to Tank Farm is not within the baseline (estimated at $50M).

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Risk Assessment Form

ID Number: 427 **Revision:** 03 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Statement of Residual Risk: A risk remains that the amount of solids carryover from DWPF becomes continually higher than anticipated. This impacts the ability to transfer recycle to the Tank Farms.

Residual Likelihood:	Unlikely	**Basis:** Upon establishing an operations history with alternate reductant, this likelihood is anticipated to drop. The likelihood has been reduced, but remains unlikely.
Residual Consequence:	Severe (Critical)	**Basis:** Having to allow settling in Tank 22 and being able to directly use DWPF recycle for salt dissolution will result in being unable to have sufficient space to continue receipt of DWPF recycle. The consequences could be up to a 1 month break in DWPF receipts for recycle settling to occur in Tank 22 prior to being able to use the contents for salt dissolution and/or evaporator feed. After settling, the use of material from Tank 22 is limited by evaporator feed tank constraints and flammability concerns in the salt dissolution tank and therefore can only be used at a limited rate. Additionally, the impact of the accumulation of solids in the salt dissolution tank may result in inefficient salt dissolution. Assuming 2 months for emptying Tank 22, the the impact to the Program would be a reduction in overall attainment of 12.5%. The Program inpact could be up to a 2 year impact. (110Mgals of salt processed at 12.5% less attainment).
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 325,000	**Most Likely** 650,000	**Worst Case** 1,300,000	Worst Case: Attainment reduction impacts Program up to 2 years. Most Likely Case: Attainment reduction impacts Program up to 1 year. Best Case: Attainment reduction impacts Program up to 6 Months.
Residual Schedule Impact :	6 Mths	1 Yr	2 Yr	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 325,000	**Most Likely** 650,000	**Worst Case** 1,300,000	Impacts based on outyear consequences only.
Residual Schedule Impact :	6 Mths	1 Yr	2 Yr	

Risk Assumptions :

32. The 2H Evaporator System is used to evaporate DWPF recycle. The 3H Evaporator is used to process streams that minimize scale production, i.e., canyon wastes and sludge batch decants. The evaporator system feed and concentrate receipt tanks configuration is:

- 3H: Feed – Tank 32; Receipt – Tanks 30 and Tank 37
- 2H: Feed – Tank 43; Receipt – Tank 38.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 430 **Revision:** 02 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: No Disposal Path Exists for Spent Solvent from ARP/MCU			
Type: Risk, External, Technical	**Category:** Regulatory and Environmental	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-OPS	**Contact:** Brent Gifford	**Date Identified:** 2/4/2014	
Statement of Event: Currently it is assumed the disposition path for ARP/MCU NGS spent solvent is reuse by SWPF (planned to be staged for SWPF reuse). A risk exists that the spent solvent cannot be reused.			
Likelihood:	Likely	**Basis:** There are several considerations which could result in not being able to reuse this solvent, e.g. programmatic, process incompatibility with SWPF flowsheet, etc.	
Consequence / Benefit:	Negligible	**Basis:** The worst case consequence would be that this waste stream after being determined to be unsuitable for reuse, is declared a waste and subject to RCRA regulations. The waste will require remediation before being disposed of by an offsite vendor. Radiological concerns can be reduced by the ability of MCU to recycle and radiologically clean the solvent to be able to transport off site for disposal, however other materials may render this a mixed hazardous waste and require further processing to allow transportation off site. Sufficient time may not be available to establish further treatment processes before fines are levied and additional costs incurred. Additional cost for remediation of $10M and off site vendor disposal of $10M. RCRA fines are not included in this estimate of consequences. No schedule impact to the Program.	
Most Significant Cost Impact ($k): 20,000		**Most Significant Schedule Impact :** 0	
Level:	**Low**	**Event Trigger:** Currently open; Close upon disposition of spent solvent after MCU shutdown.	
Handling Strategy:	Mitigate	**Description:** Identify alternate disposal paths, e.g. vendors upfront to allow effective disposal. Develop effective strategy for remediation and/or disposal of waste to avoid any RCRA violations prior to SWPF startup.	
Handling Strategy Action Items: 430.1 Identify alternate disposal paths, e.g. vendors upfront to allow effective disposal. Develop effective strategy for remediation and/or disposal of waste to avoid any RCRA violations (ensure that during routine analysis, species of concern are quantified and utilize trends identified during routine analysis of solvent samples to predict final disposal form)., Keith Harp			
HS Implementation Cost ($K):	0	**Basis:** Included in baseline	
HS Implementation Schedule:	0	**Basis:** No impact to schedule	
Other Handling Strategies: None			

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ID Number: 430 **Revision:** 02 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: Although RCRA issues are avoided, a risk remains that alternate disposal path will be required.

Residual Likelihood:	Likely	**Basis:** There are several considerations which could result in not being able to reuse this solvent, e.g. programmatic, process incompatibility etc.
Residual Consequence:	Negligible	**Basis:** The worst case consequence would be that remediation is required ($10M) and off-site vendor must be paid for disposal ($10M). No schedule impact to the Program.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 10,000	**Most Likely** 10,000	**Worst Case** 20,000	Worst Case: Remediation is required ($10M) and off-site vendor must be paid for disposal ($10M). Most Likely and Best Cases: Remediation is not required however, off-site vendor must be paid for disposal ($10M).
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 10,000	**Most Likely** 10,000	**Worst Case** 20,000	Life cycle impact based on near-term consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments:

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Risk Assessment Form

ID Number: 431 **Revision:** 02 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Event Title: No Disposal Path Exists for Spent Solvent from SWPF		
Type: Risk, External, Programmatic	**Category:** Regulatory and Environmental	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 4.1.2	**Assessable Element Title:** SWPF Salt Processing	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: DOE-SR	**Contact:** Pam Marks	**Date Identified:** 2/4/2014

Statement of Event: Currently the disposition path for SWPF spent solvent has been defined in the ICD as being disposed of by the Liquid Waste Contractor (SRR), this however is limited to only 20-50 gals of radioactive/hazardous waste. A risk exists that the final disposal of spent solvent is complex and requires further treatment of the spent solvent.

Likelihood:	Unlikely	**Basis:** The solvent waste could be a RCRA waste. A limited amount of solvent waste (limited to only 20-50 gals of radioactive/hazardous waste) could be disposed of by SRR, however, currently the final disposal path for 500 gals has not been identified and is not included in the SRR contract. It is considered unlikely that a Type A finding would be identified for this particular issue.
Consequence / Benefit:	Marginal	**Basis:** Worst case impact will be that during ORR the solvent waste is considered a waste that has no clear path for disposal and SWPF startup is delayed until such time as the final disposal path is defined. A delay of up to 6 months is incurred where a pretreatment and offsite vendor is contracted to dispose of the larger volumes of solvent waste.

Most Significant Cost Impact ($k): 325,000 **Most Significant Schedule Impact :** 6 mths

Level:	**Low**	**Event Trigger:** Currently open; Close upon exiting SWPF ORR.
Handling Strategy:	Avoid	**Description:** Perform analysis of solvent waste to better characterize waste (SWPF Project). Finalize solvent waste disposition path forward for lifecycle of SWPF.

Handling Strategy Action Items:

431.1 SWPF project office to consider data collected on MCU NGS solvent (Hg) and evaluate further analysis for other RCRA metals and develop a position for a path forward to dispose of SWPF Bob Calix solvent (specifically identify the concentration of RCRA metals) prior to ORR., Pam Marks

431.2 SRR to develop disposal plan and estimate for 500gals of spent solvent based on results of sample analysis., Keith Harp

HS Implementation Cost ($K):	0	**Basis:** The cost of solvent waste characterization and solvent disposal is within the SWPF operations baseline.
HS Implementation Schedule:	0	**Basis:** No schedule Impact.

Other Handling Strategies: None

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ID Number: 431 **Revision:** 02 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Statement of Residual Risk: This risk has been avoided.

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments:

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Risk Assessment Form

ID Number: 435 **Revision:** 02 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: High Mercury in Sludge Impacts Processing at DWPF		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste	
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations	
Responsible Org: SRR-ENG	**Contact:** Eric Freed	**Date Identified:** 2/26/2014

Statement of Event: It is currently planned to process sludge through DWPF with a greater mercury content than is currently being processed. A risk exists that the higher mercury sludge requires a longer stripping time in the SRAT.

Likelihood:	Likely	**Basis:** It is likely that, even with planned DWPF process improvements, the higher mercury levels will impact DWPF throughput based on a longer conflux time in the SRAT. DWPF mercury recovery systems may not be effectively managing mercury and a potential exists for a buildup of elemental mercury within DWPF or to recycle mercury back to the Tank Farms.
Consequence / Benefit:	Severe (Critical)	**Basis:** Reductions in throughput (SRAT conflux time and mercury management evolutions which impact production) could choke SWPF production. In effect this would limit maximum SWPF production to 6 Mgals/yr and not allow the step change in SWPF throughput to 7.2 Mgals/yr in 2020 and later 9 Mgals/yr in 2022 through 2032. This would result in a shortfall of 32 Mgals in 2032 requiring the Program be extended 5.5 years to continue processing the remaining salt at 6 Mgals/yr.

Most Significant Cost Impact ($k): 3,575,000	**Most Significant Schedule Impact :** 5.5 Yrs

Level:	**High**	**Event Trigger:** Open upon scheduled start of SWPF processing at 9 Mgals/yr: Close upon completion of Program.
Handling Strategy:	Mitigate	**Description:** The current program investigates Sludge Batch configurations to minimize the amount of Mercury in each batch. Additionally, where not impactive to canister production, sludge batch planning will investigate reducing waste loading to allow a reduced amount of mercury in each sludge transfer to DWPF. Investigate maximizing mercury strip efficiency in the SRAT (e.g. increasing steam flow to vessel).

Handling Strategy Action Items:

435.1 Investigate re-arranging Sludge Batches to minimize the amount of Mercury in each batch., Hasmukh Shah

435.2 Investigate reducing waste loading to allow a reduced amount of mercury in each sludge transfer to DWPF., Hasmukh Shah

435.3 Revise and issue Sludge Batch plan based on revised Sludge Batch strategy and decreased waste loading., Hasmukh Shah

435.4 Investigate maximizing mercury strip efficiency in the SRAT (e.g. increasing steam flow to vessel), and integrate changes into DWPF operations., John laukea

435.5 Investigate methods to periodically remove mercury-induced pluggage within the DWPF canyon PVV system., Pedro Flores, Completed, 1/21/2016

435.6 Investigate methods to periodically remove and dispose mercury from the process vessels (primarily SRAT, MWWT and SMECT) to reduce the detrimental effect of Hg solids buildup within the PVV system., Pedro Flores

435.7 Implement requirements of DWPF Mercury SEE., Bruce Klein

HS Implementation Cost ($K):	0	**Basis:** Cost already within baseline.
HS Implementation Schedule:	0	**Basis:** No impact to schedule.

Other Handling Strategies: None

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Risk Assessment Form

ID Number: 435 **Revision:** 02 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: A risk remains that the higher mercury sludge requires a longer stripping time in the SRAT.

Residual Likelihood:	Unlikely	**Basis:** Likelihood has been reduced. It is unlikely that the higher mercury levels will impact DWPF throughput based on a longer conflux time in the SRAT. DWPF mercury recovery systems may not be effectively managing mercury and a potential exists for a buildup of elemental mercury within DWPF or to recycle mercury back to the Tank Farms.
Residual Consequence:	Severe (Critical)	**Basis:** Reductions in throughput (SRAT conflux time and mercury management evolutions which impact production) could choke SWPF production resulting in limiting it to the equivalent of 7.2 Mgals/yr. In effect this would not allow the step change in SWPF throughput from 7.2 Mgals/yr to 9 Mgals/yr in 2021 through 2032 and would result in a 18Mgal shortfall resulting in a 30 month extension to the Program. (18 Mgals at 7.2Mgals/yr = 2.5 yrs)
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 812,500	**Most Likely** 812,500	**Worst Case** 1,625,000
Residual Schedule Impact :	15 Mths	15 Mths	30 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: Salt processing limited to 7.2 Mgals/yr, resulting in a 30 month extension to the Program.

Best and Most Likely Cases: Salt processing limited to ~8 Mgals/yr, resulting in a 15 month extension to the Program.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 812,500	**Most Likely** 812,500	**Worst Case** 1,625,000
Residual Schedule Impact :	15 Mths	15 Mths	30 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on risk having out-year consequences only.

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 436 **Revision:** 03 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Excessive Sludge Carryover During Boil Up		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 3 - Out Year Risk and Consequences, with Near Term Risk Handling Strategy
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste	
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations	
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 2/26/2014

Statement of Event: At DWPF boil up is performed in the SRAT and SME. A risk exists that excessive sludge carryover limits the rate at which the boil up can be performed.

Likelihood:	Likely	**Basis:** DWPF has been observing solids carryover issues in the SME and the SRAT during boil-up. Mercury Transfer Header and PVV systems have been deteriorating/plugging. As a result, the steam stripping rate in SRAT and SME are limited to ~2000#/hr rate. The design basis for SRAT and SME steam coils are 5000#/hr. DWPF process improvements are planned prior to increasing SWPF throughput to 9 Mgal/yr. Alternate reductant will help the boil up process.
Consequence / Benefit:	Severe (Critical)	**Basis:** In the worst case, DWPF throughput will be reduced and result in forcing SWPF to a lower throughput. This reduction in throughput could result in not being able to achieve planned increase to 9 Mgal/year. Remaining at 6 Mgal/yr results in extending the salt processing campaign and the Program by 5 years (30M gals i.e salt volume not processed while limited to 6 Mgals/yr, processed at the end of the Program [30/6 = 5 yrs]).

Most Significant Cost Impact ($k): 3,250,000 **Most Significant Schedule Impact :** 5 Yrs

Level:	**High**	**Event Trigger:** Open upon SWPF processing at 9 Mgals per year; Close upon SWPF shutdown.
Handling Strategy:	Mitigate	**Description:** Installed anti-foam metering system for SRAT and SME; optimized Melter offgas flammability model; Installed purge in RCT. These modifications are improving the sludge carryover and the management of solids in the system. Develop a water balance.

Handling Strategy Action Items:

436.1 Monitor and evaluate the effectiveness of the recent modifications during DWPF operation to ascertain they will be ensure adequate control of carryover when SWPF operations reaches a maximum throughput of 9 Mgals/yr., John Iaukea

436.2 Develop a water balance as part of SDI integration effort. This will take into account improvements from alternate reductant and any other water saving measures to assure that boil up/boil off operations are achievable., Keith Harp

HS Implementation Cost ($K):	0	**Basis:** Included in cost baseline.
HS Implementation Schedule:	0	**Basis:** No impact to schedule.

Other Handling Strategies: None

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Risk Assessment Form

ID Number: 436 **Revision:** 03 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: A risk remains that high sludge carryover limits the rate at which the boil up can be performed.

Residual Likelihood:	Unlikely	**Basis:** Anti-foam metering system for SRAT and SME, optimized Melter offgas flammability model and RCT purge. This reduced the likelihood of sludge carryover in the system.
Residual Consequence:	Severe (Critical)	**Basis:** In the worst case, DWPF throughput will be reduced and result in forcing SWPF to a lower throughput. This reduction in throughput could result in not being able to achieve planned increase to 9 Mgal/year. Remaining at 6 Mgal/yr results in extending the salt processing campaign and the Program by 5 years (30M gals i.e salt volume not processed while limited to 6 Mgals/yr, processed at the end of the Program [30/6 = 5 yrs]).
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 1,950,000	**Worst Case** 3,250,000
Residual Schedule Impact :	0	3 Yr	5 Yr

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: Excessive sludge carryover occurs reducing SWPF Throughput to 6 Mgals/yr (5 yr impact)

Most Likely Case: Excessive sludge carryover occurs reducing SWPF Throughput resulting in a 3yr impact.

Best Case: Excessive sludge carryover occurs, but it is managed through adding operational evolutions and adjustments.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 1,950,000	**Worst Case** 3,250,000
Residual Schedule Impact :	0	3 Yr	5 Yr

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on risk having out-year consequences only.

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments: Reference also Risk 264.

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Risk Assessment Form

ID Number: 440 **Revision:** 03 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Event Title: Prior to Closure Contamination Migrates from Vault 4			
Type: Risk, Internal, Technical	**Category:** Regulatory and Environmental	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 5.1.1	**Assessable Element Title:** Monitor Vaults		
WBS Number: 01.90.03.01	**WBS Title:** Saltstone Operations		
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 3/3/2014	
Statement of Event: Vault 4 has exhibited contamination release to soil. A risk exists that this contamination continues to such a degree that it is detected in monitoring wells and evaluated as requiring remediation.			
Likelihood:	Unlikely	**Basis:** Based on monitoring to date, the contamination is maintaining a stable level and is not increasing. Monitoring wells currently in use could be tending to produce a false high as their pentration into the tanin clay has a sump effect. An additional well is being installed which is configured to avoid this effect.	
Consequence / Benefit:	Negligible	**Basis:** In the worst case, the contamination increases and is evaluated as requiring remediation and long term mitigation. In the worst case soil will have to be excavated, disposed of and the area and backfilled with impervious material (estimated at ~ 20M). No impact to the Program schedule.	
Most Significant Cost Impact ($k): 20,000	**Most Significant Schedule Impact :** 0		
Level:	**Low**	**Event Trigger:** Currently open; Close upon final closure of Vault 4.	
Handling Strategy:	Accept	**Description:** This risk is accepted as any remediation/preventative measures would be tailored to the contamination path/mechanism encountered. Currently these are being applied to what has been experienced at Vault 4 to date (Reference V4 Contamination Minimization Study)	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 440 **Revision:** 03 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Statement of Residual Risk: A risk exists that this contamination continues to such a degree that it detected in monitoring wells and evaluated as requiring remediation.

Residual Likelihood:	Unlikely	**Basis:** Based on monitoring to date, the contamination is maintaining a stable level and is not increasing.
Residual Consequence:	Negligible	**Basis:** In the worst case, the contamination increases and is evaluated as requiring remediation and long term mitigation. In the worst case burial walls would be required (estimated at ~ 20M). No impact to the Program schedule.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	5,000	10,000	20,000
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

Worst Case: Remediation and additional preventative measures costing up to $20M.

Most Likely Case: Remediation and additional preventative measures costing up to $10M.

Best Case: Remediation and additional preventative measures costing up to $5M.

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	0	0	0
Residual Schedule Impact :	0	0	0

Basis of OUT YEAR Cost and Schedule Impacts:

N/A

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	5,000	10,000	20,000
Residual Schedule Impact :	0	0	0

Basis of LIFE CYCLE Cost and Schedule Impacts:

Impact based on near-term consequences only.

Risk Assumptions :

Event Comments: This risk is limited to Vault 4. Based on discussions with Environmental SME, the SDU design which employs a coating and leaktight testing does not present a credible risk.

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Risk Assessment Form

ID Number: 445 **Revision:** 02 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Scope to be Added to PBS-0014 Due to Dispersion Characteristics Change is not Defined (DOE Risk)			
Type: Risk, Internal, Technical	**Category:** Safety	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-ENG	**Contact:** Thomas Huff	**Date Identified:** 3/5/2014	
Statement of Event: SRR has been directed to update dispersion characteristics reflecting latest information. The impact of this update is unknown. No allowance for this change is provided for in the current baseline. This risk provides a vehicle for accounting for the uncertainty of the impact of this scope addition.			

Likelihood:	Very Likely	**Basis:** The addition of scope to incorporate the revised dispersion characteristics is a certainty. Contractual direction has been received to implement this scope. The uncertainty associated with the impact of the added scope is the subject of this risk.
Consequence / Benefit:	Significant	**Basis:** The worst case impact would be a near-term cost to upgrade selected existing safety controls and add new safety class/safety significant controls. Additional costs may also be incurred as life cycle costs for additional operating/maintenance. The impact to the Program would be the cost of modifications to facilities (Modifications are estimated at $50M for DWPF, $200M for the Tank Farms) and Program delay incurred by facility availability reduction during execution of modifications of up to 1 year (=$650M). Any additional DSA activities to support analysis of dispersion characteristics change is considered part of regular DSA maintenance.
Most Significant Cost Impact ($k): 900,000		**Most Significant Schedule Impact :** 1 Yr
Level:	**High**	**Event Trigger:** Currently open; Close upon completion of Safety Basis Strategy, concurrence by DOE and incorporation of impact into baseline.
Handling Strategy:	Mitigate	**Description:** SRR will perform upfront studies and will work closely with DOE to minimize the impact of this change.
Handling Strategy Action Items:		
HS Implementation Cost ($K):	0	**Basis:** A strategy is being developed within the current program baseline to identify necessary calculations to both minimize and identify modifications required.
HS Implementation Schedule:	0	**Basis:** No impact to schedule.
Other Handling Strategies: None		

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Risk Assessment Form

ID Number: 445 **Revision:** 02 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: After the development of a Safety Basis Strategy, the impact may be accurately estimated.

Residual Likelihood:	Very Likely	**Basis:** The addition of scope to incorporate the revised dispersion characteristics is a certainty. Contractual direction has been received to implement this scope. The uncertainty associated with the impact of the added scope is the subject of this risk.
Residual Consequence:	Marginal	**Basis:** The worst case impact would be a near-term cost to upgrade selected existing safety controls and add new safety class/safety significant controls. Additional costs may also be incurred as life cycle costs for additional operating/maintenance. The impact to the Program would be the cost of modifications to facilities (Modifications are estimated at $50M for DWPF, $200M for the Tank Farms) and Program delay incurred by facility availability reduction during execution of modifications of up to 2 months. Any additional DSA activities to support analysis of dispersion characteristics change is considered part of regular DSA maintenance.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 5,000	**Worst Case** 100,000
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

Worst Case: Additional cost of $100M to design and install Facility modifications.

Most Likely Case: Additional cost of $5M to design and install Facility modifications.

Best Case: Only calculations and evaluations which result in no modifications being performed.

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 20,000	**Worst Case** 258,000
Residual Schedule Impact :	0	0	2 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: 2 months (assuming extending an outage on critical path for an additional two months), directly impact to Program due to facility modifications. Additional cost of $150M to design and install Facility modifications.

Most Likely Case: Additional cost of $20M to design and install Facility modifications. No schedule impact.

Best Case: Only calculations and evaluations which result in no modifications being performed.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 25,000	**Worst Case** 358,000
Residual Schedule Impact :	0	0	2 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on total life cycle.

Risk Assumptions :

Event Comments: This is a crosscutting risk with all PBSs.

PBS SR-0014

Risk Assessment Form

ID Number: 446 **Revision:** 02 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Event Title: Saltstone WAC for I-129 Impacts Salt Processing			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1.2	**Assessable Element Title:** SWPF Salt Processing		
WBS Number: 01.90.03.01	**WBS Title:** Saltstone Operations		
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 3/6/2014	
Statement of Event: Saltstone WAC is currently 63 pci/ml for Iodine 129. It is assumed that this limit can be raised to accommodate a higher limit in some or all future salt batches if necessary A risk exists that this is not feasible. Significant adjustment of salt feed is required to ensure the Saltstone WAC limit is met.			
Likelihood:	Very Unlikely	**Basis:** Previous projections indicated that the total I-129 currently in waste is between 17- 38 curies. To disposition this inventory at 63 pci/ml would require between 75 M - 160 Mgals to be processed through salt processing. More recent information projects the total I-129 to be less than 17 curies which would require less than 75 Mgals to be processed. Since it is not practical to assume each batch will be optimally loaded at 63pci/ml, or that the total I-129 may be more than currentley projected, it is possible that the total volume will exceed the 110 Mgals projected by the System Plan Revision 20.	
Consequence / Benefit:	Severe (Critical)	**Basis:** In the worst case, assuming a total of 38 curies of I-129 are present and up to 90% of the 63 pci/ml is met on average (instead of 110 Mgals, 180Mgals would have to be processed), this would result in up to a 7 year Program impact for additional salt processing. Up to 5 additional SDUs will be required (5x$125M)	
Most Significant Cost Impact ($k): 5,175,000		**Most Significant Schedule Impact :** 7 Yrs	
Level:	**Moderate**	**Event Trigger:** Currently open; Close upon completion of Program.	
Handling Strategy:	Mitigate	**Description:** Further investigate and develop a path forward which includes a plan to reduce uncertainty in the I-129 inventory and investigate parameters within the PA which may allow for a higher level of I-129 in some or all of the disposal units. This approach will build upon WCS improvements made and include any necessary R&D and testing. This approach should ultimately target enabling the I-129 WAC limit to be raised if necessary. Develop a path forward to allow a "totalized" measurement of I-129 to be used as part of the WAC which will accommodate averaging of I-129.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** Currently investigating, developing a sampling plan, sampling, R&D, etc., are not currently within the baseline but will be planned.	
HS Implementation Schedule:	0	**Basis:** No impact to execution baseline.	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 446 **Revision:** 02 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Statement of Residual Risk: A risk exists that significant adjustment of salt feed is required to ensure the Saltstone disposal unit inventory limit is met.

Residual Likelihood:	Very Unlikely	**Basis:** The likelihood of realizing this risk has been reduced by better understanding the I-129 inventory, raising the disposal unit inventory for I-129 for some or all disposal units if necessary, and developing a path forward which allows totalizing or averaging I-129.
Residual Consequence:	Severe (Critical)	**Basis:** The worst case impact has been reduced by modifying the WAC, however the worst case residual impact could be up to an additional 5 years of salt processing.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 650,000	**Most Likely** 1,950,000	**Worst Case** 3,250,000	Worst Case: Up to 5 Years additional Salt processing. Most Likely Case: Up to 3 Years additional Salt processing. Best Case: Up to 1 Year additional Salt processing.
Residual Schedule Impact :	1 Yr	3 Yrs	5 Yrs	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 650,000	**Most Likely** 1,950,000	**Worst Case** 3,250,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	1 Yr	3 Yrs	5 Yrs	

Risk Assumptions :

18. During SWPF operation:

-SPF and SDF will support SWPF processing rates

-Additional operational time (i.e., multiple shifts, additional operating days each week, etc.) and adequate SDU receipt space to match production streams from SWPF are planned

-Modifications will provide sufficient contingency storage capacity to minimize impacts to SWPF or ETF due to SPF or SDF outages.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 448 **Revision:** 01 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Event Title: Salt Precipitated from DWPF Recycle Requires Criticality Sampling Prior to Dissolution			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-ENG	**Contact:** Thomas Huff	**Date Identified:** 4/23/2014	

Statement of Event: Currently DWPF recycle is received in the Tank Farm (Tank 22) and when Tank 22 is periodically de-inventoried this material is planned to be transferred to other tanks. This material will precipitate as salt containing fissile material. Currently it is assumed that a NCSE will qualify this material for dissolution. A risk exists that qualification by NCSE is unsuccessful and sampling is required to support criticality evaluation prior to dissolution.

Likelihood:	Likely	**Basis:** Enrichment has been maintained below limits to date, however, it is uncertain what future sludge batches will contain.
Consequence / Benefit:	Significant	**Basis:** In the worst case, sampling will have to be performed in support of a criticality evaluation. Sampling equipment will have to be designed and fabricated as well as establishment of a sample analysis capability. The cost for the first tank would be up to $10M (sampling equipment and analysis capability and actual sample retrieval), and for an estimated three further tanks at $1M each for sample retrieval and analysis (total $13M). The impact to the Program would be a feed break to SWPF of up to 18 months while sampling tool is designed, fabricated, sample retrieved and analyzed. This would be an eighteen month extension to salt processing and hence the Program.

Most Significant Cost Impact ($k): 988,000 **Most Significant Schedule Impact :** 18 Mths

Level:	**Moderate**	**Event Trigger:** Open upon salt dissolution of the first tank that contains de-inventoried material from Tank 22; Close upon DWPF recycle no longer returning to Tank Farm.
Handling Strategy:	Mitigate	**Description:** Identify early, those tanks where this event could occur (e.g. Tank 37 FY16 dissolution campaign), ensure sufficient time is allowed in batch planning to perform a NCSE evaluation without impacting salt dissolution. Develop a backup strategy to take these salt source tanks off line should the event occur and be able to substitute with an alternate salt feed tank to avoid feed break. This would enable the tank of concern to be sampled and NCSE performed in parallel with salt batch preparation so that it is available as a source tank for another salt batch.

Handling Strategy Action Items:

448.2 Perform NCSE early, to identify potential need for sampling ahead of time., Thomas Huff

448.3 Identify early, those tanks where this event could occur (e.g. Tank 37 FY16 dissolution campaign), ensure sufficient time is allowed in batch planning to perform a NCSE evaluation without impacting salt dissolution., John Schwenker

HS Implementation Cost ($K):	0	**Basis:** Included in current baseline.
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies: Begin development of a sampling tool and establishing analytical capabilities. Investigate and deploy unit operation to avoid sending DWPF recycle to Tank Farm is not within the baseline. Design and fabricate a salt sampling tool and establish analytical capabilities

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Risk Assessment Form

ID Number: 448 **Revision:** 01 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Statement of Residual Risk: Even with avoiding the schedule delay by identification of tanks where this can be an event, performing early NCSE and providing a backup tank as a salt source, a risk remains that sampling will have to be performed prior to salt dissolution.

Residual Likelihood:	Likely	**Basis:** The likelihood remains unchanged.
Residual Consequence:	Negligible	**Basis:** Schedule impact has been avoided by early identifiaction and substituion of a different salt source tank. A cost impact remains to develop and deploy a salt sampling tool ($10M) and the cost to sample and analyze samples, and perform NCSEs for each salt batch from each of the three tanks currrently containing the DWPF recycle material. (3 tanks [30, 37 and 38]) x 2 samples x 3 dissolutions @ 1M per)
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 22,000	**Worst Case** 28,000	Worst Case: Samples are required on three tanks. Most Likely Case: Samples are rquired on two tanks. Best Case: Inputs can be refined and no samples are required.
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 22,000	**Worst Case** 28,000	Impacts based on near-term consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

31. Tank Farm feed preparation infrastructure modifications required to support SWPF processing rates including:
   -H-Tank Farm Blend tanks readiness for salt solution preparation
   -F-Tank Farm Blend tanks readiness for salt solution preparation
   -Tank 49 readiness as SWPF feed tank
   -Mixing capabilities
   -Enhanced transfer capabilities
   -Transfer routes provided to feed tank.

14. DWPF recycle is beneficially reused.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 450 **Revision:** 02 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Event Title: SWPF Accelerated Salt Dissolution Does not Permit NCSE Aerial Density Analyses Techniques			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 4.1.2	**Assessable Element Title:** SWPF Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-ENG	**Contact:** John Occhipinti	**Date Identified:** 4/23/2014	
Statement of Event: Currently it is assumed that criticality analyses can utilize aerial density techniques. A risk exists that due to the demand for SWPF feed, the quicker mixing required during salt dissolution results in not being able to use this analytical technique.			
Likelihood:	Unlikely	**Basis:** Recent dissolutions have shown that quicker dissolution can be performed using modified density gradient techniques (feed and bleed).	
Consequence / Benefit:	Significant	**Basis:** The worst case would be that sampling must be performed to provide data for the NCSE. Salt batch preparation is impacted while equipment is readied, salt samples are taken, loading/unloading and analytical facilities are readied, samples analyzed and then the criticality and salt batch dissolution/preparation strategies are adjusted. (SRR and SRNL currently do not have the capability to retrieve and handle salt core samples). This could result in a feed break to SWPF of up to 18 months and a cost of $10M for sampling, analysis and criticality evaluations for the first occurrence. After that, the salt batching plan will include sampling for all salt tanks. This would introduce up to $25M in additional cost (assuming 25 tanks would have to be sampled at a cost of $1M per tank).	
Most Significant Cost Impact ($k): 1,010,000		**Most Significant Schedule Impact :** 18 Mths	
Level:	**Moderate**	**Event Trigger:** Open upon first salt dissolution in support of SWPF feed preparation; Close upon completion of salt processing.	
Handling Strategy:	Mitigate	**Description:** Investigate the validity of aerial density techniques during accelerated salt dissolution. If invalid, ready sampling and analytical facilities and integrate these activities into Salt Batch planning. Program delays will be avoided.	
Handling Strategy Action Items: 450.1 Investigate the validity of aerial density techniques during accelerated salt dissolution., Thomas Huff 450.2 Begin development of a sampling tool and establishing analytical capabilities., To Be Assigned			
HS Implementation Cost ($K):	0	**Basis:** Investigation of aerial density techniques during accelerated salt dissolution is within the current baseline. However it is anticipated the cost to design and fabricate a salt sampling tool and establish analytical capabilities, estimated at $10M would be included in the baseline upon completion of investigations and recommnedations.	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 450 **Revision:** 02 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Statement of Residual Risk: A risk remains that due to the demand for SWPF feed, the quicker mixing required during salt dissolution results in not being able to use this analytical technique.

Residual Likelihood:	Unlikely	**Basis:** Recent dissolutions have shown that quicker dissolution can be performed using modified density gradient techniques (feed and bleed).
Residual Consequence:	Negligible	**Basis:** All Cases: Sampling required on 25 tanks, $25M.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 5,000	**Most Likely** 5,000	**Worst Case** 5,000	All Cases: Sampling required on five tanks, $5M.
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 20,000	**Most Likely** 20,000	**Worst Case** 20,000	All Cases: Sampling required on 20 tanks, $20M.
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 25,000	**Most Likely** 25,000	**Worst Case** 25,000	Residual impact based on total life cycle.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

31. Tank Farm feed preparation infrastructure modifications required to support SWPF processing rates including:

-H-Tank Farm Blend tanks readiness for salt solution preparation

-F-Tank Farm Blend tanks readiness for salt solution preparation

-Tank 49 readiness as SWPF feed tank

-Mixing capabilities

-Enhanced transfer capabilities

-Transfer routes provided to feed tank.

Salt Processing and salt batch need dates are projected by the Salt Batch Plan.

Event Comments:

PBS SR-0014 **Risk Assessment Form**

ID Number: 451 **Revision:** 02 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Site Utility Outage (DOE RISK)			
Type: Risk, External, Technical	**Category:** Project Integration / Interfaces	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-PLAN	**Contact:** Delane Maxwell	**Date Identified:** 5/14/2014	
Statement of Event: SRR relies upon site infrastructure, and the ability of the M&O and DOE/Ameresco to provide reliable utility services e.g. steam, electrical power, domestic water, fire water, well water (process water), sanitary sewers, roads, rail etc. A risk exists that a utility service becomes non-operational and Liquid Waste is without that service until it is restored.			
Likelihood:	Likely	**Basis:** The M&O contractor and DOE/Ameresco maintain services supplied to LWO in functional status by predictive, preventive, trouble shooting and scheduled maintenance. Although a new biomass plant (Ameresco) is fully operational and has been "de-bugged," an unplanned outage was experienced in January 2014 which significantly impacted Liquid Waste operations. A minor steam reduction occurred due to an unplanned outage in January 2016. It is considered likely that a future unplanned outage may occur. Weather protection has been constructed around the biomass plant, backup biomass plant and backup package boiler and single point failures eliminated. Instrumentation and critical systems have been protected against severe freezes. Currently the biomass plant and package boiler are on line, the backup biomass plant is scheduled to be on line in June 2016.	
Consequence / Benefit:	Marginal	**Basis:** The worst case would be an interruption of the steam supply to Liquid Waste for an extended period. The configuration of Biomass and package boiler will allow sufficient steam to avoid any equipment failure, however an impact to operations would result. In the worst case a major Biomass plant component failure could result in operations being halted until the backup biomass plant is brought on line in June 2016 which would be a 5 month impact. Liquid Waste Systems will failsafe, and additional measures for the Tank Farms will be installed to manage rain water intrusion to valve boxes and sumps. (this is normally performed with steam jet pumps). Added tank HEPA filter monitoring and replacement would also be required. After resumption of service, a staged restart will be performed of up to a 1 month duration during which systems will be brought back to normal operating status after rainwater disposition in annulus spaces and diversion/valve boxes. The total impact could be up to 6 months delay to the Program. Additional heat tracing and insulation have been installed on Tank Farm components and systems to minimize freeze damage. Enhanced communication protocols are in place to allow an optimal steam load shedding.	
Most Significant Cost Impact ($k): 325,000		**Most Significant Schedule Impact :** 6 Mths	
Level:	**Moderate**	**Event Trigger:** Currently open: Close upon completion of Program.	
Handling Strategy:	Avoid	**Description:** DOE/Ameresco will avoid the risk of steam supply failure at a site level with the addition of a redundant biomass plant and non-co-located package boiler. To ensure reliable infrastructure is maintained in response to PBS needs, SRR will incorporate lessons learned actions resulting from analysis of the January 2014 steam outage event. Table top drill has been performed.	
Handling Strategy Action Items: 451.1 Incorporate lessons learned from January 2014 outage into plant, personnel and procedures and perform training as directed in STAR Item (2014-CTS-001438)., Mike Borders			
HS Implementation Cost ($K):	0	**Basis:** No additional cost. DOE/Ameresco and M&O risk management	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: None			

PBS SR-0014 **Risk Assessment Form**

ID Number: 451 **Revision:** 02 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: After the implementation of all handling strategies have been completed, site utility systems are only vulnerable to force majures such as NPH events. These events are extremely low probability and are not considered as part of this risk assessment. This Program risk will have been avoided.

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments: This is an interface risk with M&O and DOE/Aremesco.

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Risk Assessment Form

ID Number: 452 **Revision:** 02 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: As Found Field Configurations on Old Style Tanks do not Match Technical Baseline			
Type: Risk, Internal, Technical	**Category:** Resources/Conditions	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 6.0	**Assessable Element Title:** Closure (Tanks, Evap. & Ancil. Equip) Including Heel Removal		
WBS Number: 01.90.01	**WBS Title:** Waste Removal and Tank Closure		
Responsible Org: SRR-CL	**Contact:** Janice Williams	**Date Identified:** 9/22/2014	
Statement of Event: Field configurations of old style tanks and associated equipment are documented on drawings which are used as the basis for tank closure or waste removal modifications. A risk exists that as found conditions are different than expected, driving rework and delays.			
Likelihood:	Very Likely	**Basis:** Experience to date (most recently on Tanks 15 and 16) has shown that waste removal and tank closure modifications to older inactive systems, structures and components often require rework due to unexpected as-found conditions.	
Consequence / Benefit:	Negligible	**Basis:** Recent experience indicates approximately $1M per tank in rework costs and approximately 3 months delay (non-critical path). With 16 old-style tanks remaining this could be an additional cost of up to $16M.	
Most Significant Cost Impact ($k): 16,000		**Most Significant Schedule Impact :** 0	
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of old style tank closures.	
Handling Strategy:	Mitigate	**Description:** Develop revised approach to investigating and documenting as-found conditions early in design process. Based on lessons learned, anticipate and allow for potential adverse as found conditions after D&R.	
Handling Strategy Action Items: 452.1 Develop revised approach to investigating and documenting as-found conditions early in design process., John Occhipinti, Completed, 1/26/2016			
HS Implementation Cost ($K):	0	**Basis:** Within the current cost baseline.	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 452 **Revision:** 02 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: Some risk remains as it is not feasible to investigate remote, high rad areas prior to all design activities.

Residual Likelihood:	Unlikely	**Basis:** Likelihood has been reduced as many areas can be investigated.
Residual Consequence:	Negligible	**Basis:** By early identification in many areas, the worst case has been reduced to $500K per tank.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 1,600	**Most Likely** 4,000	**Worst Case** 8,000	Worst Case: 16 old style tanks have additional $500K in re-design and rework costs. Most Likely: 16 old style tanks have additional $250K in re-design and rework costs. Best Case: 16 old style tanks have additional $100K in re-design and rework costs.
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 1,600	**Most Likely** 4,000	**Worst Case** 8,000	Residual impact based on outyear consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

22. Types I, II, and IV tanks (Tanks 1–24):

-Waste Removal and Tank Removal from Service commitments are per the FFA

- Types I, II, and IV tanks (including Tanks 4, 7, 8, 11, and 21 through 24) may be used to optimize output of the Plan.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 454 **Revision:** 01 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Gas Retention in Waste Impacts Bulk Waste Removal			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 6.0	**Assessable Element Title:** Closure (Tanks, Evap. & Ancil. Equip) Including Heel Removal		
WBS Number: 01.90.01	**WBS Title:** Waste Removal and Tank Closure		
Responsible Org: SRR-ENG	**Contact:** Thomas Huff	**Date Identified:** 3/5/2015	
Statement of Event: During the storage of waste, gas (principally hydrogen) is generated and released. This is managed by the current controls (e.g. ventilation). A risk exists that the control process for managing gas retention is inadequate for Bulk Waste removal operations.			
Likelihood:	Very Likely	**Basis:** Instances have already been encountered (PISA for trapped gas).	
Consequence / Benefit:	Marginal	**Basis:** The strategy to manage this emergent risk of gas retention impacts bulk waste removal. In the worst case this could delay bulk waste removal until the correct control set is identified and deployed (e.g. sequencing of mixer pumps etc.), and when deployed could impact up to two months to BWR. The worst case could be up to 2 months. Assuming multiple occurrences (estimated at 4) this cumulative impact could be up to 8 months, minimal costs for additional calculations would be incurred and additional pumps or spares may be required at a cost of up to $10M (6 pumps).	
Most Significant Cost Impact ($k): 443,000		**Most Significant Schedule Impact :** 8 Mths	
Level:	**Moderate**	**Event Trigger:** Currently open; Close upon completion of BWR.	
Handling Strategy:	Avoid	**Description:** Incorporate lessons learned (e.g. develop reasonable control set options ahead of BWR), provide contingency within the BWR schedule and/or System Plan to accommodate additional allowance for realizing this risk.	
Handling Strategy Action Items: 454.1 Develop reasonable control set options ahead of BWR., John Occhipinti			
HS Implementation Cost ($K):	0	**Basis:** No additional cost.	
HS Implementation Schedule:	0	**Basis:** No impact to schedule anticipated, however this will be confirmed in System Plan if contingency is provided.	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 454 **Revision:** 01 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: With the implementation of controls this risk has been avoided.

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

22. Types I, II, and IV tanks (Tanks 1–24):

-Waste Removal and Tank Removal from Service commitments are per the FFA

- Types I, II, and IV tanks (including Tanks 4, 7, 8, 11, and 21 through 24) may be used to optimize output of the Plan.

23. Type III and IIIA (Tanks 25–51):

-While the Type III and IIIA tanks are not included in the FFA, commitment for completion of waste removal (bulk waste and heel) from all tanks is per the STP

-Tanks are not required to be isolated and grouted to meet the STP

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 455 **Revision:** 01 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: TSR Limit Prevents Tank Entering Closure Mode After Cleaning has Been Completed			
Type: Risk, Internal, Technical	**Category:** Safety	**Group:** 3 - Out Year Risk and Consequences, with Near Term Risk Handling Strategy	
Assessable Element : 6.0	**Assessable Element Title:** Closure (Tanks, Evap. & Ancil. Equip) Including Heel Removal		
WBS Number: 01.90.01	**WBS Title:** Waste Removal and Tank Closure		
Responsible Org: SRR-ENG	**Contact:** John Occhipinti	**Date Identified:** 3/5/2015	
Statement of Event: After Highly Radioactive Radionuclides (HRRs) have been removed to the MEP, the tank willl enter closure mode and closure will proceed to completion. A risk exists that even though HRRs have been removed to the MEP, the inventory of the tank has not been reduced sufficiently to allow entering into closure mode within TSR limits.			
Likelihood:	Likely	**Basis:** Recently HRRs were removed to the MEP from Tank 6 and yet approached the TSR limit for proceeding into closure mode.	
Consequence / Benefit:	Negligible	**Basis:** In the event of not being able to enter closure mode, cleaning would have to be restarted or a DSA exception made. Both of these solutions would result in a delay to closure and additional costs. Worst case would be up to a 6 month delay with additional cleaning costs of up to $2M. Assuming 10 tanks this could be up to $20M. The delay would not be a direct impact to the Program.	
Most Significant Cost Impact ($k): 20,000	**Most Significant Schedule Impact :** 0		
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of Program.	
Handling Strategy:	Mitigate	**Description:** Develop, on a tank by tank basis, cleaning strategies to meet TSR and MEP (e.g. continual sampling, after BWR sample to provide indication of how much cleaning would be required to enter closure mode). Additionally, where more effective, investigate utilizing a safety basis change to allow closure to proceed.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** Considered within outyear baseline.	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: Develop cleaning strategies to meet TSR and MEP (e.g. continual sampling, after BWR sample to provide indication of how much cleaning would be required to enter closure mode.			

PBS SR-0014 **Risk Assessment Form**

ID Number: 455 **Revision:** 01 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: A risk remains that even though HRRs have been removed to the MEP, the inventory of the tank has not been reduced sufficiently to allow entering into closure mode within TSR limits.

Residual Likelihood:	Likely	**Basis:** Recently HRRs were removed to the MEP from Tank 6 and yet approached the TSR limit for proceeding into closure mode.
Residual Consequence:	Negligible	**Basis:** By sampling and identifying where meeting TSR limits will require extended cleaning, impact to stopping and restarting cleaning is avoided, schedule impact is lessened. After additionally investigating safety basis changes and applying where practical, the risk remains on a limited number of tanks that TSR limits may not be met. Assume 5 tanks with a six month delay and an additional cost of $500K to establish controls during final closure (e.g. ventilation). The delay would not be a direct impact to the Program.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 500	**Most Likely** 1,500	**Worst Case** 2,500	Worst Case: Additional cost of 500K each for 5 tanks and a 5 months delay to individual tank closures, but no schedule impact to the Program. Most Likely Case: Additional cost of 500K each for 3 tanks and a 5 months delay to individual tank closures, but no schedule impact to the Program. Best Case: Additional cost of 500K for 1 tank and a 5 months delay to tank closure, but no schedule impact to the Program.
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 500	**Most Likely** 1,500	**Worst Case** 2,500	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

22. Types I, II, and IV tanks (Tanks 1–24):

-Waste Removal and Tank Removal from Service commitments are per the FFA

- Types I, II, and IV tanks (including Tanks 4, 7, 8, 11, and 21 through 24) may be used to optimize output of the Plan.

23. Type III and IIIA (Tanks 25–51):

-While the Type III and IIIA tanks are not included in the FFA, commitment for completion of waste removal (bulk waste and heel) from all tanks is per the STP

-Tanks are not required to be isolated and grouted to meet the STP

Event Comments:

PBS SR-0014 **Risk Assessment Form**

ID Number: 457 **Revision:** 01 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Event Title: SCDHEC does not Allow Temporary Use of Old Style Tanks After BWRE			
Type: Risk, Internal, Technical	**Category:** Regulatory and Environmental	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 2.0	**Assessable Element Title:** Store Liquid Radioactive Waste		
WBS Number: 01.90.02.01	**WBS Title:** F-H Tank Farm Facilities		
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 3/11/2015	
Statement of Event: It is currently assumed within System Plan 20 that old-style tanks may be used temporarily to store liquid waste provided it is waste that has been removed from another old-style tank. A risk exists that SCDHEC may not allow any waste back into an old-style tanks after they have gone through BWRE.			
Likelihood:	Unlikely	**Basis:** Using old-style tanks in this manner will accelerate the rate at which BWRE can be achieved and therefore reduce the amount of material at risk which is the primary goal of SCDHEC.	
Consequence / Benefit:	Severe (Critical)	**Basis:** Using the old-style tanks in this manner after BWRE allows the preparation of feed for SWPF and to facilitate aluminum dissolution during sludge batch preparation. Without being able to re-use the Old-style tanks, insufficient feed would be available for SWPF resulting in slower salt processing rates and/or impacts to aluminum dissolution would result in additional canisters being created during sludge vitrification at DWPF. Although these impacts would vary depending on the point in time the additional tank space is required and for which operation, the overall impact could be an equivalent to 2 years delay to the Program.	
Most Significant Cost Impact ($k): 1,300,000		**Most Significant Schedule Impact :** 2 yrs	
Level:	**Moderate**	**Event Trigger:** Currently open; Close upon agreement with SCDHEC for limited re-use of old style tanks after BWRE.	
Handling Strategy:	Mitigate	**Description:** Continue dialogue with SCDHEC to ensure the regulators are aware of the impact of not allowing limited re-use of old-style tanks after BWRE (i.e. material at risk for longer, SWPF not operating at full capacity, program slowed down with additional costs for PBS-SR-0014 and follow on closure PBS-SR-0030).	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** No additional cost to the Program.	
HS Implementation Schedule:	0	**Basis:** No schedule impact to the Program.	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 457 **Revision:** 01 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Statement of Residual Risk: A risk remains that SCDHEC may not allow any waste back into an old-style tanks after they have gone through BWRE.

Residual Likelihood:	Very Unlikely	**Basis:** The likelihood has been reduced based on keeping the Regulators and SCDHEC appraised of the adverse consequences of not being allowed limited use of old-style tanks after BWRE.
Residual Consequence:	Severe (Critical)	**Basis:** Using the old-style tanks in this manner after BWRE allows the preparation of feed for SWPF and to facilitate aluminum dissolution during sludge batch preparation. Without being able to re-use the Old-style tanks, insufficient feed would be available for SWPF resulting in slower salt processing rates and/or impacts to aluminum dissolution would result in additional canisters being created during sludge vitrification at DWPF. Although these impacts would vary depending on the point in time the additional tank space is required and for which operation, the overall impact could be an equivalent to 2 years delay to the Program.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 325,000	**Most Likely** 650,000	**Worst Case** 1,300,000	Worst Case: No waste is allowed back into old-style tanks with up to 2 years impact to the Program.
Residual Schedule Impact :	6 Mths	1 yr	2 yrs	Most Likely Case: Significant restrictions are placed on the reuse of old-style tanks with up to 1 year impact to the Program. Best Case: Minor restrictions are placed on the reuse of old-style tanks with up to 6 months impact to the Program.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 325,000	**Most Likely** 650,000	**Worst Case** 1,300,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	6 Mths	1 yr	2 yrs	

Risk Assumptions :

22. Types I, II, and IV tanks (Tanks 1–24):

-Waste Removal and Tank Removal from Service commitments are per the FFA

- Types I, II, and IV tanks (including Tanks 4, 7, 8, 11, and 21 through 24) may be used to optimize output of the Plan.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 458 **Revision:** 01 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Targeted Sludge Tank Does not Contain Predicted Quantity of Sludge			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.2	**Assessable Element Title:** Sludge Processing		
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations		
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 3/12/2015	
Statement of Event: Sludge tanks are targeted for sludge removal to provide sludge for sludge batch preparation. Sludge batches provide feed to DWPF. A risk exists that when sludge removal is initiated, it is found the targeted sludge tank does not have sufficient sludge to complete the sludge batch preparation as planned. Although there is less sludge in this specific tank, the overall estimate of sludge to be processed in the Program remains the same.			
Likelihood:	Likely	**Basis:** Recent experience with Tank 13 has shown this to be likely. This is most likely with Evaporator feed tanks where soundings may predict greater quantities of sludge due to it being mixed with the saltcake.	
Consequence / Benefit:	Severe (Critical)	**Basis:** In the worst case, no alternate tank is readily available as a source tank for sludge. A tank would have to be identified, readied (pumps, etc., installed), salt removed etc., which could take up to 2 years, even on an expedited basis. No additional costs would be incurred, however, a Program delay of up to two years would be realized.	
Most Significant Cost Impact ($k): 1,300,000		**Most Significant Schedule Impact :** 2 Yrs	
Level:	**High**	**Event Trigger:** Currently open; Close upon completion of sludge processing.	
Handling Strategy:	Mitigate	**Description:** Investigate acceleration of making an alternate tank ready prior to scheduled need date. Implement actions as feasible to accelerate. Continue processing with a lower sludge loading to prevent impacts to SWPF and/or lower the canister production rate while still avoiding any impact to SWPF.	
Handling Strategy Action Items: 458.1 Investigate acceleration of making an alternate tank ready prior to scheduled need date. Implement actions as feasible to accelerate., Ty Blackford			
HS Implementation Cost ($K):	0	**Basis:** No additional costs, however funding profile will change.	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: Maintain a fully readied alternate sludge tank at all times to avoid this risk. Evaluate waste loading increase.			

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Risk Assessment Form

ID Number: 458 **Revision:** 01 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: A risk remains that when sludge removal is initiated, it is found the targeted sludge tank does not have sufficient sludge to complete the sludge batch preparation as planned.

Residual Likelihood:	Likely	**Basis:** Likelihood is unchanged. Recent experience with Tank 13 has shown this to be likely. This is most likely with Evaporator feed tanks where soundings may predict greater quantities of sludge due to it being mixed with the saltcake.
Residual Consequence:	Significant	**Basis:** The worst case impact has been reduced to having to process sludge that is located in other tanks at maximum sludge loading. Assuming sludge loading or canister production decrease was equivalent to ~50% reduction in sludge being processed, the Program impact would be 1 year.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 163,000	**Most Likely** 325,000	**Worst Case** 650,000	Worst Case: Equivalent of 50% sludge production resulting in 1 year delay to the Program.
Residual Schedule Impact :	3 Mths	6 Mths	1 Yr	Most likely case: Equivalent of 75% sludge production, resulting in a 6 month delay to the Program. Best case: Equivalent of 87.5% sludge production resulting in a 3 month delay to the Program.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 163,000	**Most Likely** 325,000	**Worst Case** 650,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	3 Mths	6 Mths	1 Yr	

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 459 **Revision:** 01 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Warehouse Fire Destroys Critical Equipment (Excluding Melters) (DOE Risk)			
Type: Risk, Internal, Programmatic	**Category:** Resources/Conditions	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-OPS	**Contact:** Guy Campbell	**Date Identified:** 3/19/2015	
Statement of Event: Currently critical equipment is stored in warehouses without fire protection sprinkler systems. A risk exists that a fire occurs within a warehouse (e.g. 713-2N or 713-3N) and without fire suppression to protect the critical equipment, the equipment is destroyed.			
Likelihood:	Very Unlikely	**Basis:** It is considered very unlikely that a fire would occur based on controls placed on warehouse storage (e.g. separation of hazardous chemicals, walkdowns etc.). Sprinkler systems do exist within these buildings, however they are not required to be connected based upon a DOE approved fire protection exclusion.	
Consequence / Benefit:	Significant	**Basis:** In the worst case a fire damages all equipment within one of the warehouses, resulting in costs to replace equipment of up to $100M. If the critical spare equipment was required to ensure continuing production e.g. a pump required for SWPF batch and feed preparation or actual feeding, the delay could be up to 1 year while a spare is procured on an expedited basis. This would be a direct impact of 1 year delay to the Program.	
Most Significant Cost Impact ($k): 750,000		**Most Significant Schedule Impact :** 1 Yr	
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of PBS operations.	
Handling Strategy:	Accept	**Description:** This risk has been accepted by DOE	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 459 **Revision:** 01 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: A risk exists that a fire occurs within a warehouse (e.g. 713-2N or 713-3N) and without fire suppression to protect the critical equipment, the equipment is destroyed.

Residual Likelihood:	Very Unlikely	**Basis:** It is considered very unlikely that a fire would occur based on controls placed on warehouse storage (e.g. separation of hazardous chemicals, walkdowns etc.). Sprinkler systems do exist within these buildings, however they are not required to be connected based upon a DOE approved fire protection exclusion.
Residual Consequence:	Significant	**Basis:** In the worst case a fire damages all equipment within one of the warehouses, resulting in costs to replace equipment of up to $100M. If the critical spare equipment was required to ensure continuing production e.g. a pump required for SWPF batch and feed preparation or actual feeding, the delay could be up to 1 year while a spare is procured on an expedited basis. This would be a direct impact of 1 year delay to the Program.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	25,000	50,000	100,000
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

Worst Case: Full cost of replacing all inventoried spare equipment.

Most Likely Case: Cost of replacing half of the inventoried spare equipment.

Best Case: Cost of replacing 25% of the inventoried spare equipment.

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	163,000	325,000	650,000
Residual Schedule Impact :	3 Mths	6 Mths	1 Yr

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: Delay to Program of up to 1 year while a major spare is procured.

Most Likely Case: Delay to Program of up to 6 months while spare equipment is procured.

Best Case: Delay to Program of up to 3 months while spare equipment is procured.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	188,000	375,000	750,000
Residual Schedule Impact :	3 Mths	6 Mths	1 Yr

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on total life cycle.

Risk Assumptions :

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 460 **Revision:** 01 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Event Title: SDUs are Not Available When Required (Acquisition Delays) (DOE Risk)			
Type: Risk, External, Programmatic	**Category:** Management	**Group:** 3 - Out Year Risk and Consequences, with Near Term Risk Handling Strategy	
Assessable Element : 5.1	**Assessable Element Title:** Grout Encapsulation of Waste		
WBS Number: 01.90.03.01	**WBS Title:** Saltstone Operations		
Responsible Org: DOE-SR	**Contact:** Shane Farrell	**Date Identified:** 3/19/2015	
Statement of Event: Future SDUs will be line item projects and as such the initiation of the project is subject to congressional approval of funding. A risk exists that the line item submittal is not made in time for the fiscal year approval or the line item is delayed due to the restrictions imposed by exercising a continuing resolution.			
Likelihood:	Very Likely	**Basis:** System Plan need dates are known and the time necessary to design and construct an SDU is being established by SDU 6 execution. Annual continuing resolutions have been the general practice for funding SRS. Currently funding restrictions relating to SDU 7 make this risk very likely to occur.	
Consequence / Benefit:	Significant	**Basis:** In the worst case, an annual submittal is missed and the line item has to be authorized as part of the next fiscal budget approval cycle. If on critical path, this would delay the availability of a future SDU by up to 1 year, resulting in a Program impact of 1 year.	
Most Significant Cost Impact ($k): 650,000		**Most Significant Schedule Impact :** 1 Yr	
Level:	**High**	**Event Trigger:** Currently open; Close upon approval to proceed with SDU 13.	
Handling Strategy:	Avoid	**Description:** Ensure SDU project acquisition strategy identifies the appropriate fiscal period to submit project data and begin acquisition. Provide sufficient allowance for budget perturbations e.g. continuing resolutions. Investigate the practicality of deploying a smaller SDU which will require a reduced funding profile and provide a "stop gap" measure to deployment of a large SDU. If practical develop a decision point within the SDU deployment strategy to ensure design of a smaller SDU can be intitiated and deployment can be achieved in time to avoid any impact.	
Handling Strategy Action Items: 460.1 Submit SDU 7 as an emergency line item into the FY 17 appropriations budget., Shane Farrell 460.2 Submit SDU 8 as a line item., Shane Farrell 460.3 Perform an alternative analysis which investigates the practicality of deploying a smaller SDU which will require a reduced funding profile and provide a "stop gap" measure to deployment of a large SDU and issue a report with recommendations., Shane Farrell 460.4 Implement the recommendations of alternative analysis in Project Planning, acquisition strategy and System Planning (e.g., deploy a smaller SDU, decision date, etc..). Part of SDU 7 CD-1., Pete Hill			
HS Implementation Cost ($K):	0	**Basis:** A smaller SDU will be an additional cost (relative to $/volume of saltstone disposal), however if necessary the smaller SDU will be planned to avoid this risk.	
HS Implementation Schedule:	0	**Basis:** No impact to schedule.	
Other Handling Strategies: None			

PBS SR-0014 **Risk Assessment Form**

ID Number: 460 **Revision:** 01 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Statement of Residual Risk: Risk Has been avoided.

Residual Likelihood:	N/A	**Basis:** N/A	
Residual Consequence:	N/A	**Basis:** N/A	
Residual Risk Level:			

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

18. During SWPF operation:

-SPF and SDF will support SWPF processing rates

-Additional operational time (i.e., multiple shifts, additional operating days each week, etc.) and adequate SDU receipt space to match production streams from SWPF are planned

-Modifications will provide sufficient contingency storage capacity to minimize impacts to SWPF or ETF due to SPF or SDF outages.

20. Three SDUs, SDU-2, SDU-3, and SDU-5 are in service. Neither Vault 1 or Vault 4 are planned to receive additional saltstone grout.

-Each gallon of DSS feed, when added to the cement, flyash, and slag, makes 1.76 gallons of grout

-SDU-2, SDU-3, and SDU-5 have two 150-foot diameter by 20-foot tall disposal cells. Each cell will contain ~2,300 kgal of grout. Therefore, each cell holds ~1,290 kgal of Tank 50 material feed solution; each SDU holds ~2,580 kgal of Tank 50 material feed solution

-SDU-6 through SDU-13, will be a single 375-foot diameter by 43-foot tall disposal cell which can contain 32 Mgal of grout. With the cold cap it will have a capacity of 30 Mgal of contaminated grout or 17.1 Mgal of Tank 50 material feed solution.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 461 **Revision:** 01 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Additional Requirements Imposed on Tank Farm Operation Due to Hanford Vapor Issues		
Type: Risk, External, Programmatic	**Category:** Safety	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: SRR-OPS	**Contact:** Mike Borders	**Date Identified:** 3/24/2015

Statement of Event: A Hanford Tank Vapor Assessment Report (SRNL-RP-2014-00791) has recently been issued by a team of recognized experts in occupational and environmental health, environmental engineering and science, toxicology, health physics, and industrial hygiene. This assessment was performed in response to continuing reports and complaints from workers about health effects from potential exposure to chemical vapors emanating from the Hanford waste tanks. The Assessment Report contained 57 total recommendations for changes to the Hanford tank vapor management program. In response to the assessment, Hanford has issued a two phase implementation plan to address the recommendations. Phase 1 of the Hanford plan, to be completed in FY2016, has an estimated cost of $60 to $70M. A risk exists that some of the Hanford Assessment recommendations may be applicable to SRS requiring changes to the current SRR tank vapor management program.

Likelihood:	Unlikely	**Basis:** It is considered unlikely that changes to the SRS vapor management program will result from the Hanford Assessment.
Consequence / Benefit:	Negligible	**Basis:** The consequences at SRS should be less than at Hanford due to less organics in the waste and the use of active ventilation on the waste tanks which is used to control releases. It is difficult to predict what actions might be necessary for the worst case, but significant changes to the vapor management program could increase life cycle costs in the Tank Farms (A worst case scenario would involve significant monitoring, instrumentation and equipment development, and work practice changes that could result in costs approaching $50M).

Most Significant Cost Impact ($k): 50,000 **Most Significant Schedule Impact :** 0

Level:	**Low**	**Event Trigger:** Currently open; Close upon evaluation of Hanford Tank Farm report and evaluation of SRS operations.
Handling Strategy:	Mitigate	**Description:** Evaluate the Hanford Tank Vapor Assessment Report recommendations. Determine applicability to SRR, whether the SRR program has deficiencies related to the recommendation, and an action plan to resolve identified deficiencies.

Handling Strategy Action Items:

461.1 Evaluate Hanford Tank Vapor Assessment Report and associated Implementation Plan. Determine applicability to SRR, gaps in the SRR tank vapor management program, and develop an Action Plan to address gaps., Donnie Thaxton, Completed, 1/25/2016

461.2 Implement Action Plan for Response to Hanford Tank Vapor Assessment., Mike Borders

HS Implementation Cost ($K):	0	**Basis:** Within current baseline.
HS Implementation Schedule:	0	**Basis:** No impact to schedule

Other Handling Strategies: None

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Risk Assessment Form

ID Number: 461 **Revision:** 01 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: A risk remains that some of the Hanford Assessment recommendations may be applicable to SRS requiring changes to the current SRR tank vapor management program.

Residual Likelihood:	Unlikely	**Basis:** The likelihood has been reduced by pro-actively identifying and addressing those Hanford issues which are applicable to Tank Farm operation.
Residual Consequence:	Negligible	**Basis:** The consequences have been marginally reduced by pro-actively addressing issues. The worst case impact would involve significant monitoring, instrumentation and equipment development, and work practice changes that could result in costs approaching $45M.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 500	**Most Likely** 1,000	**Worst Case** 45,000
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

Worst Case: Significant monitoring, instrumentation and equipment development, and work practice changes resulting in costs approaching $45M.

Most Likely Case: Monitoring, instrumentation and equipment development, and work practice changes resulting in costs approaching $1M.

Best Case: Minor monitoring, instrumentation and equipment development, and work practice changes resulting in costs approaching $500K.

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0
Residual Schedule Impact :	0	0	0

Basis of OUT YEAR Cost and Schedule Impacts:

N/A

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 500	**Most Likely** 1,000	**Worst Case** 45,000
Residual Schedule Impact :	0	0	0

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on risk having near-term consequences only.

Risk Assumptions :

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 462 **Revision:** 01 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Event Title: Increased Aluminum due to Aluminum Dissolution Creates Precipitation During Processing			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1.2	**Assessable Element Title:** SWPF Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-ENG	**Contact:** Ryan McNew	**Date Identified:** 3/25/2015	
Statement of Event: Aluminum dissolution will be performed to reduce mass to be vitrified (minimize number of cans). A risk exists that the additional aluminum precipitates out during salt processing at SWPF.			
Likelihood:	Unlikely	**Basis:** This phenomena has already been encountered during ARP/MCU operation.	
Consequence / Benefit:	Significant	**Basis:** In the worst case SWPF would halt operations to dissolve precipitates and restart the process. This would take up to 3 months to correct. Assuming this happens with four batches, the impact could be up to 1 year.	
Most Significant Cost Impact ($k): 650,000		**Most Significant Schedule Impact :** 1 Yr	
Level:	**Moderate**	**Event Trigger:** Currently open; Close upon completion of salt processing.	
Handling Strategy:	Mitigate	**Description:** Maximize aluminum in salt feed to allowable soluble Al in the salt batch; and add hydroxide (within Tank Farm or SWPF) prior to processing . These handling strategies should be worked in conjunction with handling strategies for Risk 251.	
Handling Strategy Action Items: 462.1 Develop a process to ensure SWPF WAC and Tank Farm calculation results are used to optimize the Tank Farm salt batch hydroxide/aluminum ratio for both facilities., Keith Harp 462.1 Perform OLI calculation prior to salt batch processing to identify upper processability limit of Al.,			
HS Implementation Cost ($K):	0	**Basis:** No additional cost.	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: Investigate methods of aluminum removal.			

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Risk Assessment Form

ID Number: 462 **Revision:** 01 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Statement of Residual Risk: A risk remains that the additional aluminum precipitates out during salt processing at SWPF.

Residual Likelihood:	Very Unlikely	**Basis:** It is less likely that precipitation will occur.
Residual Consequence:	Significant	**Basis:** In the worst case SWPF would halt operations to dissolve precipitates and restart the process. This would take up to 3 months to correct. Assuming this happens with four batches, the impact could be up to 1 year.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 163,000	**Most Likely** 325,000	**Worst Case** 650,000	Worst Case: 1 year impact, event occurs on 4 batches (3 months X 4). Most Likely Case: 6 months impact, event occurs on 2 batches (3 months X 2). Best Case: 3 months impact, event occurs on 1 batch (3 months X 1).
Residual Schedule Impact :	3 Mths	6 Mths	1 Yr	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 163,000	**Most Likely** 325,000	**Worst Case** 650,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	3 Mths	6 Mths	1 Yr	

Risk Assumptions :

4. SWPF nominal capacity is:

-4.625 Mgal/yr for the first year of operation

-7.2 Mgal/yr for the next two years of operation

-An SWPF outage is assumed at an appropriate time afetr the SWPF first year of operation to perform next generation solvent implementation to increase facility capacity to 9.0 Mgal/yr

-Nominally SWPF will produce:

- For each gallon processed, ~1.28 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Note: When production exceeds 7.2Mgal/yr, SE will be limited to 576 kgal/yr

Event Comments: This interface risk exists for the first year of SWPF operations (prior to turnover to long-term operator).

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Risk Assessment Form

ID Number: 463 **Revision:** 01 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Event Title: Increased Level of Mercury in Saltstone Grout		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 5.1	**Assessable Element Title:** Grout Encapsulation of Waste	
WBS Number: 01.90.03.01	**WBS Title:** Saltstone Operations	
Responsible Org: SRR-ENG	**Contact:** Richard Edwards	**Date Identified:** 3/25/2015

Statement of Event: Mercury within stored waste will eventually be dispositioned by processing, qualified effluent paths, or within a final wasteform. A risk exists that more mercury than planned is directed for disposal through SPF into saltstone.

Likelihood:	Unlikely	**Basis:** Recently TCLP results indicate that increased levels of mercury are being found within samples of the grout matrix. This would indicate the assumptions of mercury balance within the flowsheet may be inadequate. 1st quarter and 2nd quarter TCLP were satisfactory and subsequent salt batch is expected to pass TCLP. Mercury is being actively managed.
Consequence / Benefit:	Severe (Critical)	**Basis:** The worst near-term case could be the remediation of saltstone grout placed with mercury levels outside of the SCDHEC permit limits and a long term impact of a revision of the WAC limit and /or grout formulation. SPF operations would not be allowed until new WAC limit and or grout formulation are deployed. A mercury removal process may also be required to achieve the new WAC limit. A near term cost of up to $20M would be incurred for remediation of out of spec grout, $100M for deployment of a mercury removal system and new grout formulations. A new mercury removal process could take up to 4 years to deploy during which time SPF would be processing at an equivalent 50% capacity due to feed dilution. The Program would be therefore impacted by a delay of up to 2 yrs.

Most Significant Cost Impact ($k): 1,420,00	**Most Significant Schedule Impact :** 2 Yrs

Level:	**Moderate**	**Event Trigger:** Currently open; Close upon completion of SPF processing.
Handling Strategy:	Mitigate	**Description:** Form a task team to investigate the fate of mercury in the HLW System and make recommendations; Reestablish mercury removal capability at DWPF. Clarified TCLP Performance Criteria for Hg is the toxicity threshold.

Handling Strategy Action Items:

463.1 Form a task team to investigate the fate of mercury in the HLW System and make recommendations in a formal report., Richard Edwards, Completed, 1/19/2016

463.2 Reestablish mercury removal capability at DWPF., Bruce Klein

HS Implementation Cost ($K):	0	**Basis:** Within current baseline.
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies: Fully implement recommendatons of SEE by funding R&D into alternate Hg removal unit operations. Investigate and deploy a unit operation to curtail sending DWPF recycle to the Tank Farm.

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Risk Assessment Form

ID Number: 463 **Revision:** 01 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Statement of Residual Risk: A risk remains that more mercury than planned is directed for disposal through SPF into saltstone.

Residual Likelihood:	Unlikely	**Basis:** Likelihood has been reduced but remains unlikely.
Residual Consequence:	Severe (Critical)	**Basis:** The worst near-term case could be the remediation of saltstone grout placed with mercury levels outside of the SCDHEC permit limits and a long term impact of a revision of the WAC limit and /or grout formulation. SPF operations would not be allowed until new WAC limit and or grout formulation are deployed. A mercury removal process may also be required to achieve the new WAC limit. A near term cost of up to $20M would be incurred for remediation of out of spec grout, $100M for deployment of a mercury removal system and new grout formulations. A new mercury removal process could take up to 4 years to deploy during which time SPF would be processing at an equivalent 50% capacity due to feed dilution. The Program would be therefore impacted by a delay of up to 2 yrs.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Worst Case: Cost of Mercury removal system and remediation of grout.
	0	0	120,000	Most Likely Case: Reformulation of salt batches is required.
Residual Schedule Impact :	0	0	0	Best Case: Reformulation of salt batches is required.

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Worst Case: 2 years impact to Program while mercury removal system is deployed.
	325,000	650,000	1,300,000	Most Likely Case: Delay for salt batch reformulation of up to 1 year.
Residual Schedule Impact :	6 Mths	1 Yr	2 Yrs	Best Case: Delay for salt batch reformulation of up to 6 months.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Residual impact based on total life cycle.
	320,000	650,000	1,420,000	
Residual Schedule Impact :	6 Mths	1 Yr	2 Yrs	

Risk Assumptions :

18. During SWPF operation:

-SPF and SDF will support SWPF processing rates

-Additional operational time (i.e., multiple shifts, additional operating days each week, etc.) and adequate SDU receipt space to match production streams from SWPF are planned

-Modifications will provide sufficient contingency storage capacity to minimize impacts to SWPF or ETF due to SPF or SDF outages.

Event Comments:

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Risk Assessment Form

ID Number: 466 **Revision:** 01 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Increased Levels of Mercury in HLW System Creates Industrial Hazards		
Type: Risk, Internal, Technical	**Category:** Safety	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: SRR-OPS	**Contact:** Mike Borders	**Date Identified:** 3/25/2015

Statement of Event: The high level waste in the Tank Farms includes many tons (estimated to be more than 80 tons) of mercury. It has been recognized that the current processing methods re-cycle most of the mercury resulting in increasing mercury concentrations within the waste remaining in the Tank Farms. A risk exists that this increasing mercury concentration will result in an industrial hazard (e.g., dermal contact or inhalation) during the processing of salt and sludge.

Likelihood:	Unlikely	**Basis:** Currently mercury levels appear to be greater than anticipated within incidental waste streams created from processing of salt waste and sludge.
Consequence / Benefit:	Negligible	**Basis:** The worst case would be the additional cost of PPE, administrative controls, or engineered controls over the entire life of the Tank Farm operations. While this is difficult to assess, an estimate of an additional $50M over the life of the Tank Farms was assumed as the worst case.

Most Significant Cost Impact ($k): 50,000 **Most Significant Schedule Impact :** 0

Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of processing.
Handling Strategy:	Mitigate	**Description:** Evaluate the dermal contact hazard resulting from the increasing mercury concentrations in the waste to determine if mitigation is needed.

Handling Strategy Action Items:

466.2 Implement recommendations from LWS Mercury SEE report (Y-AES-G-00013, Rev 0), Mike Borders

466.3 Restablish mercury removal capability at DWPF., Joel Cantrell

HS Implementation Cost ($K):	0	**Basis:** No additional cost.
HS Implementation Schedule:	0	**Basis:** No impact to schedule.

Other Handling Strategies: Investigate and deploy unit operation to avoid sending DWPF recycle to Tank Farm is not within the baseline (estimated at $50M).

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Risk Assessment Form

ID Number: 466 **Revision:** 01 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: A risk remains that this increasing mercury concentration will result in an industrial hazard (dermal contact) during the processing of salt and sludge.

Residual Likelihood:	Very Unlikely	**Basis:** The likelihood has been reduced by the resumption of mercury removal at DWPF and the increased removal in the Tank Farm.
Residual Consequence:	Negligible	**Basis:** The impact has been reduced by the resumption of mercury removal at DWPF and by implementing mitigation recommendations. The worst case is estimated at an additional $20M cost of PPE, administrative controls, or engineered controls over the life of the Tank Farms.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 2,000	**Most Likely** 5,000	**Worst Case** 10,000	Worst Case: $10M cost of PPE, administrative controls, or engineered controls. Most Likely Case: $5M cost of PPE, administrative controls, or engineered controls. Best Case: $2M cost of PPE, administrative controls, or engineered controls.
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 2,000	**Most Likely** 5,000	**Worst Case** 10,000	Worst Case: $10M cost of PPE, administrative controls, or engineered controls. Most Likely Case: $5M cost of PPE, administrative controls, or engineered controls. Best Case: $2M cost of PPE, administrative controls, or engineered controls.
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 4,000	**Most Likely** 10,000	**Worst Case** 20,000	Residual impact based on total life cycle.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments:

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Risk Assessment Form

ID Number: 467 **Revision:** 01 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Oxalates Impact Salt Processing			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-ENG	**Contact:** Mark Keefer	**Date Identified:** 3/25/2015	
Statement of Event: Oxalates are present in stored waste and are also being introduced into the system as part of cleaning operations (tanks and 512-S filter). A risk exists that the level of oxalates in salt feed are high enough to promote precipitation of oxalate solids during processing.			
Likelihood:	Very Likely	**Basis:** This has already been encountered at ARP/MCU. Some tanks have material in storage which may create higher oxalate concentrations.	
Consequence / Benefit:	Significant	**Basis:** In the worst case SWPF would halt operations to dissolve precipitates and restart the process. This would take up to 3 months to correct. Assuming this happens with four batches, the impact could be up to 1 year.	
Most Significant Cost Impact ($k): 650,000		**Most Significant Schedule Impact :** 1 Yr	
Level:	**High**	**Event Trigger:** Currently open; Close upon completion of salt processing.	
Handling Strategy:	Mitigate	**Description:** Minimize oxalate use, i.e. 512-S filter cleaning and tank cleaning. Use an ion exchange process on high oxalate bearing tanks and low sodium salt at end of Program. This would send DSS (containing oxalates) to saltstone.	

Handling Strategy Action Items:

467.1 Deploy an ion exchange process on tanks with known high oxalate concentrations., Mark Keefer

467.2 Evaluate the effectiveness of chemical cleaning vs the benefit with respect to system plan impacts based on experience and data gained. Issue report with recommendations for including in the System Plan., Ryan McNew

467.3 Update System Plan to incorporate the recommendations of report, Pete Hill

467.4 Develop and issue a report for the next group of tanks to undergo cleaning which evaluates and recommends a cleaning strategy., To Be Assigned

467.5 Evaluate the need for development of a disposition pathway (which may include permanent disposition in the Tank Farm, destruction of current Tank Farm oxalates, and/or methods to avoid further production/introduction [e.g., ECC] of oxalates into Tank Farm)., To Be Assigned

HS Implementation Cost ($K):	0	**Basis:** Ion exchange is currently not funded, however, in the outyears it is anticipated that this will be planned.
HS Implementation Schedule:	0	**Basis:** No impact to schedule.

Other Handling Strategies: Develop and deploy an oxalate destruction process.

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ID Number: 467 **Revision:** 01 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: A risk remains that the level of oxalates in salt feed are high enough to promote precipitation of oxalate solids during processing.

Residual Likelihood:	Likely	**Basis:** The likelihood has been reduced by performing ion exchange on high oxalate tanks.
Residual Consequence:	Marginal	**Basis:** In the worst case SWPF would halt operations to dissolve precipitates and restart the process. This would take up to 3 months to correct. Assuming this happens with two batches, the impact could be up to 6 months.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 163,000	**Most Likely** 163,000	**Worst Case** 325,000	Worst Case: 6 Month impact, event occurs on 2 batches (3 months X 2). Most Likely Case and Best Case: 3 months impact, event occurs on 1 batch (3 months X 1).
Residual Schedule Impact :	3 Mths	3 Mths	6 Mths	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 163,000	**Most Likely** 163,000	**Worst Case** 325,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	3 Mths	3 Mths	6 Mths	

Risk Assumptions :

4. SWPF nominal capacity is:

-4.625 Mgal/yr for the first year of operation

-7.2 Mgal/yr for the next two years of operation

-An SWPF outage is assumed at an appropriate time afetr the SWPF first year of operation to perform next generation solvent implementation to increase facility capacity to 9.0 Mgal/yr

-Nominally SWPF will produce:

- For each gallon processed, ~1.28 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Note: When production exceeds 7.2Mgal/yr, SE will be limited to 576 kgal/yr

18. During SWPF operation:

-SPF and SDF will support SWPF processing rates

-Additional operational time (i.e., multiple shifts, additional operating days each week, etc.) and adequate SDU receipt space to match production streams from SWPF are planned

-Modifications will provide sufficient contingency storage capacity to minimize impacts to SWPF or ETF due to SPF or SDF outages.

Event Comments: This interface risk exists for the first year of SWPF operations (prior to turnover to long-term operator).

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Risk Assessment Form

ID Number: 468 **Revision:** 01 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: DWPF Sand Filter is Expended Before Design Life is Reached			
Type: Risk, Internal, Technical	**Category:** Process Performance - Equip./Infrastr.Failures	**Group:** 3 - Out Year Risk and Consequences, with Near Term Risk Handling Strategy	
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste		
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations		
Responsible Org: SRR-OPS	**Contact:** George Matis	**Date Identified:** 3/31/2015	
Statement of Event: The DWPF sand filter is designed for the life of the facility. A risk exists that the facility life is extended or additional processing is required which expends the sand filter before DWPF's mission is complete.			
Likelihood:	Very Unlikely	**Basis:** Recently a migration of radionuclides has been observed to a higher level than expected in the sand filter. This is being considered as a fluctuation and not a trend.	
Consequence / Benefit:	Negligible	**Basis:** In the worst case a new sand filter would be required however, production would not be halted as monitoring would be used to determine the point in time the new sand filter would be required and it will be constructed and be ready to be brought on line in time for the predicted need date. The cost of the sand filter and connection could be up to 20M.	
Most Significant Cost Impact ($k): 20,000		**Most Significant Schedule Impact :** 0	
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of DWPF operations.	
Handling Strategy:	Accept	**Description:** This risk is accepted as there are no practical measures for mitigation.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 468 **Revision:** 01 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: A risk remains that the facility life is extended or additional processing is required which expends the sand filter before DWPF's mission is complete.

Residual Likelihood:	Very Unlikely	**Basis:** Recently a migration of radionuclides has been observed to a higher level than expected in the sand filter. This is being considered as a fluctuation and not a trend.	
Residual Consequence:	Negligible	**Basis:** In the worst case a new sand filter would be required however, production would not be halted as monitoring would be used to determine the point in time the new sand filter would be required and it will be constructed and be ready to be brought on line in time for the predicted need date. The cost of the sand filter and connection could be up to 20M.	
Residual Risk Level:	**Low**		

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 20,000	**Most Likely** 20,000	**Worst Case** 20,000	All Cases: $20M cost of a replacement sand filter.
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 20,000	**Most Likely** 20,000	**Worst Case** 20,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments:

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Risk Assessment Form

ID Number: 469 **Revision:** 01 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Event Title: Sampling Requirements at MCU Limit Planned Throughput			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1.1	**Assessable Element Title:** ARP/MCU Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-OPS	**Contact:** Brent Gifford	**Date Identified:** 4/6/2015	
Statement of Event: Currently samples are taken at MCU on each SEHT batch prior to transfer to provide confirmation that transferred material is within WAC (66mg/L isopar) limits. A risk exists that this sample/send process constrains throughput.			
Likelihood:	Very Likely	**Basis:** During operations to date, sampling has been shown to constrain production throughput. To meet DSA requirements each strip effluent batch must be characterized before it is received at DWPF. Sampling must be completed and batch transferred before the process is allowed to add any more material to the SEHT. While running at planned throughput, the process must be slowed to allow sampling time. Additionally sample analysis durations do not allow characterization before introducing strip effluent into DWPF.	
Consequence / Benefit:	Negligible	**Basis:** The worst case would limit throughput to 1.25Mgals/yr as opposed to the planned 1.5. This would result in approximately 750Kgals not being processed by MCU resulting in a Program impact of .75/9 yrs (4 weeks).	
Most Significant Cost Impact ($k): 50,000		**Most Significant Schedule Impact :** 4 Wks	
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of ARP/MCU processing.	
Handling Strategy:	Mitigate	**Description:** Perform a VSA / RIE and implement appropriate recommendations (e.g., Reduce the need to sample each SEHT batch using process history, statistical analysis etc.; moving the point of compliance to DWPF SEFT [sample SEFT] etc.).	
Handling Strategy Action Items: 469.1 Perform a VSA / RIE and, Brent Gifford 469.2 Implement appropriate recommendations from VSA/RIE., Brent Gifford			
HS Implementation Cost ($K):	0	**Basis:** No additional cost to Program.	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 469 **Revision:** 01 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Statement of Residual Risk: A risk remains that this sample/send process constrains throughput.

Residual Likelihood:	Likely	**Basis:** Likelihood has been reduced.
Residual Consequence:	Negligible	**Basis:** The worst case would limit throughput to 1.25Mgals/yr as opposed to the planned 1.5. This would result in approximately 750Kgals not being processed by MCU resulting in a Program impact of .75/9 yrs (4 weeks).
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 25,000	**Worst Case** 50,000	Worst Case: Throughput limited to 1.25Mgals/yr which impacts Program 4 weeks. Most Likely Case: Throughput limited which impacts Program 2 weeks. Best Case: Minor production impacts up to 1 week.
Residual Schedule Impact :	1 Wk	2 Wks	4 Wks	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 25,000	**Worst Case** 50,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	1 Wk	2 Wks	4 Wks	

Risk Assumptions :

2. ARP/MCU:

-No major modifications to ARP/MCU will be implemented to increase processing capacity to over 3 million gallons per year. Modifications that may be made including upgrading ARP/MCU facilities as required to maintain the operating rate for the extended life.

-ARP/MCU facilities operate to ensure the total Interim Salt Treatment curies emplaced in SPF are within the amount identified in Savannah River Site – Liquid Waste Disposition Processing Strategy (SRS LW Strategy), as amended by letter from the South Carolina Department of Health and Environmental Control (SCDHEC) to DOE-SR and the Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site.

-A seven-month outage in FY17 is planned, coincident with a DWPF melter change-out. This outage will allow for ARP/MCU facility upgrades, which may include contactor bearings, weir adjustment, etc.

-Nominally ARP/MCU will produce:

- For each gallon processed, ~1.2 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Event Comments:

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Risk Assessment Form

ID Number: 470 **Revision:** 01 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Event Title: Processing Higher Curie Feed Increases MCU Outage Durations			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1.1	**Assessable Element Title:** ARP/MCU Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-OPS	**Contact:** Brent Gifford	**Date Identified:** 4/6/2015	
Statement of Event: MCU is processing higher curie feed (~0.8ci/gal) Salt Batch 8. A risk exists that due to the increased curie loading, contamination levels are elevated which require more flushing, frequent HEPA filter changeouts, decontamination and generally more intensive controls to achieve ALARA levels for radworkers.			
Likelihood:	Very Likely	**Basis:** MCU will be operating past its initial operating life and already has begun to exhibit an increase in dose while processing a lower curie feed. Sampling at DWPF is also challenged with the increased Ci loading and has already approached the point of forcing MCU into a sample and hold mode without the higher Ci feed.	
Consequence / Benefit:	Negligible	**Basis:** The worst case would be the cumulative effect of extensions to outages (additional flushing, HEPA changeout etc.) up to an additional 1.5 months per year in outage duration for three years resulting in a 4.5 month impact to MCU processing. This would be up to a 4.5/12 x 1.5 Mg=563Kgals not processed or an impact to the Program of 0.563/9 yrs or 3 week impact to the Program.	
Most Significant Cost Impact ($k): 37,500		**Most Significant Schedule Impact :** 3 Wks	
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of ARP/MCU processing.	
Handling Strategy:	Mitigate	**Description:** Evaluate and implement temp mods/modifications to reduce HEPA filter loading.	
Handling Strategy Action Items: 470.1 Evaluate and implement temp mods/modifications to reduce HEPA filter loading., Brent Gifford			
HS Implementation Cost ($K):	0	**Basis:** No additional cost to Program.	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 470 **Revision:** 01 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Statement of Residual Risk: A risk remains that due to the increased curie loading, contamination levels are elevated which require more flushing, decontamination and generally more intensive controls to achieve ALARA levels for radworkers.

Residual Likelihood:	Likely	**Basis:** Likelihood has been reduced by implementing temp mods and modifications.
Residual Consequence:	Negligible	**Basis:** The worst case would be the cumulative effect of extensions to outages (additional flushing, HEPA changeout etc.) up to an additional 1.5 months per year in outage duration for three years resulting in a three month impact to MCU processing. This would be up to a 4.5/12 x 1.5 Mg=563Kgals not processed or an impact to the Program of 0.563/9 yrs or 3 week impact to the Program.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 25,000	**Worst Case** 37,500	Worst Case: Additional 1.5 months/yr outage duration resulting in 3 weeks impact to Program. Most Likely Case: Additional 2 weeks impact to Program. Best Case: Additional 1 week impact to Program.
Residual Schedule Impact :	1 Wk	2 Wks	3 Wks	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 25,000	**Worst Case** 37,500	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	1 Wk	2 Wks	3 Wks	

Risk Assumptions :

2. ARP/MCU:

-No major modifications to ARP/MCU will be implemented to increase processing capacity to over 3 million gallons per year. Modifications that may be made including upgrading ARP/MCU facilities as required to maintain the operating rate for the extended life.

-ARP/MCU facilities operate to ensure the total Interim Salt Treatment curies emplaced in SPF are within the amount identified in Savannah River Site – Liquid Waste Disposition Processing Strategy (SRS LW Strategy), as amended by letter from the South Carolina Department of Health and Environmental Control (SCDHEC) to DOE-SR and the Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site.

-A seven-month outage in FY17 is planned, coincident with a DWPF melter change-out. This outage will allow for ARP/MCU facility upgrades, which may include contactor bearings, weir adjustment, etc.

-Nominally ARP/MCU will produce:

- For each gallon processed, ~1.2 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Event Comments:

PBS SR-0014 **Risk Assessment Form**

ID Number: 471 **Revision:** 01 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Event Title: Tank 50 Cannot be Transferred to Saltstone			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1.1	**Assessable Element Title:** ARP/MCU Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-OPS	**Contact:** Brent Gifford	**Date Identified:** 4/6/2015	
Statement of Event: Tank 50 contents must be qualified to meet Saltstone WAC. A risk exists that a condition where waste transferred to Tank 50 results in not being able to meet Saltstone WAC (e.g. MCU upset condition, high curie waste from filter cleaning, RCRA metals, etc.).			
Likelihood:	Unlikely	**Basis:** Upset conditions at MCU have previously resulted in material having no disposition path other than Tank 50. At the lower curie feed being processed (~0.2 Ci/gal), this could be accommodated. However, with a higher curie feed (~0.8 Ci/gal) it is likely that Tank 50 will be disqualified from feeding Saltstone and its contents (or a large portion thereof) would have to be returned to the Tank Farm.	
Consequence / Benefit:	Negligible	**Basis:** In the worst case, the entire contents or a large portion of Tank 50 contents would have to be transferred back to the Tank Farm. This would result in a loss of production at MCU of up to 6 months (~750Kgals of salt not processed) for tank agitation to reduce isopar levels so the material (up to 750Kgals) can be transferred back to the Tank Farm. This results in an additional loss of salt production of 1.5Mgals to be processed by SWPF. This results in an impact to the Program of 1.5/9 yrs ~2 months.	
Most Significant Cost Impact ($k): 108,000		**Most Significant Schedule Impact :** 2 Mths	
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of ARP/MCU processing.	
Handling Strategy:	Accept	**Description:** N/A	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 471 **Revision:** 01 **Last Date Evaluated:** 2/11/2016 **Status:** Active

Statement of Residual Risk: A risk remains that a condition where waste transferred to Tank 50 results in not being able to meet Saltstone WAC (e.g. MCU upset condition, high curie waste from filter cleaning, RCRA metals, etc,).

Residual Likelihood:	Unlikely	**Basis:** Upset conditions at MCU have previously resulted in material having no disposition path other than Tank 50. At the lower curie feed being processed (~0.2 Ci/gal), this could be accommodated. However, with a higher curie feed (~0.8 Ci/gal) it is likely that Tank 50 will be disqualified from feeding Saltstone and its contents (or a large portion thereof) would have to be returned to the Tank Farm. Likelihood has been reduced by being able to send filter cleaning residual material to DWPF, however likelihood remains likely.
Residual Consequence:	Negligible	**Basis:** In the worst case, the entire contents or a large portion of Tank 50 contents would have to be transferred back to the Tank Farm. This would result in a loss of production at MCU of up to 6 months (~750Kgals of salt not processed) for tank agitation to reduce isopar levels so the material (up to 750Kgals) can be transferred back to the Tank Farm. This results in an additional loss of salt production of 1.5Mgals to be processed by SWPF. This results in an impact to the Program of 1.5/9 yrs ~2 months.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 75,000	**Most Likely** 75,000	**Worst Case** 108,000	Worst Case: 2 months impact to Program based on 6 months outage of MCU and additional 750kgals of salt to be processed.
Residual Schedule Impact :	6 Wks	6 Wks	2 Mths	Most Likely Case and Best Case: 1.2 months impact to Program based on 3 months outage of MCU (375Kgals) and additional 750Kgals of salt to be processed.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 75,000	**Most Likely** 75,000	**Worst Case** 108,000	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	6 Wks	6 Wks	2 Mths	

Risk Assumptions :

2. ARP/MCU:

-No major modifications to ARP/MCU will be implemented to increase processing capacity to over 3 million gallons per year. Modifications that may be made including upgrading ARP/MCU facilities as required to maintain the operating rate for the extended life.

-ARP/MCU facilities operate to ensure the total Interim Salt Treatment curies emplaced in SPF are within the amount identified in Savannah River Site – Liquid Waste Disposition Processing Strategy (SRS LW Strategy), as amended by letter from the South Carolina Department of Health and Environmental Control (SCDHEC) to DOE-SR and the Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site.

-A seven-month outage in FY17 is planned, coincident with a DWPF melter change-out. This outage will allow for ARP/MCU facility upgrades, which may include contactor bearings, weir adjustment, etc.

-Nominally ARP/MCU will produce:

- For each gallon processed, ~1.2 gal of DSS for SPF
- For each gallon processed, ~0.08 gal of SE for DWPF
- For each gallon processed, ~0.02 gal of MST solids/sludge for DWPF.

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 472 **Revision:** 01 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: DOE Directs Additional Business/Project Requirements on Lower Level Activities (DOE Risk)			
Type: Risk, External, Programmatic	**Category:** Project Integration / Interfaces	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-WD	**Contact:** Kim Hauer	**Date Identified:** 4/8/2015	
Statement of Event: Currently DOE O 413.3B and its associated guides and letters of interpretation apply a tiered structure to the application of requirements to projects and operations activities. A risk exists that DOE directs SRR to lower the threshold of the tiered structure and apply additional business/project requirements to lower level projects and activities.			
Likelihood:	Very Likely	**Basis:** DOE HQ are drafting revisions to 413.3B and associated guides. These revisions reflect a lowering of thresholds to the application of requirements to projects and operations activities.	
Consequence / Benefit:	Severe (Critical)	**Basis:** In the worst case, projects and operations activities whose cost exceeds $10M would be required to undergo decision gates, external reviews involving additional work to prepare CD packages, route and review, comment incorporation and also the assembly of external review teams, support of reviews etc. These additional activities could increase the cost of project work and delay the completion milestones. This could impact the Program on critical path projects such as Canister Double Stack, Large Tank Strike, Cs Removal, SWPF integration modifications etc., and also result in further challenging the ability to meet FFA milestone dates when imposed on closure activities. (assuming an average of 15 activities each at $10M/year increased by 20%, would result in an increase of $30M per each year of scope execution. Schedule delays on critical path activities could be up to 1 month each year (24 months).	
Most Significant Cost Impact ($k): 2,020,000		**Most Significant Schedule Impact :** 24 Mths	
Level:	**High**	**Event Trigger:** Currently open; Close upon receipt of DOE direction.	
Handling Strategy:	Mitigate	**Description:** Ensure DOE is appraised of the impact of these changes; Utilize appropriate baseline change control to incorporate changing requirement; anticipate review requirements and obtain and deploy contractor and DOE resources early.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** No additional cost to Program.	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 472 **Revision:** 01 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: A risk remains that DOE directs SRR to lower the threshold of the tiered structure and apply additional business/project requirements to lower level projects and activities.

Residual Likelihood:	Very Likely	**Basis:** DOE HQ are drafting revisions to 413.3B and associated guides. These revisions reflect a lowering of thresholds to the application of requirements to projects and operations activities.
Residual Consequence:	Significant	**Basis:** In the worst case, projects and operations activities whose cost exceeds $10M would be required to undergo decision gates, external reviews involving additional work to prepare CD packages, route and review, comment incorporation and also the assembly of external review teams, support of reviews etc. These additional activities could increase the cost of project work and delay the completion milestones. This could impact the Program on critical path projects such as Canister Double Stack, Large Tank Strike, Cs Removal, SWPF integration modifications etc., and also result in further challenging the ability to meet FFA milestone dates when imposed on closure activities. (assuming an average of 15 activities each at $10M/year increased by 5%, would result in an increase of $7.5M per year, ($180M over the life of the Program). Schedule delays on critical path activities could be up to 2 weeks each year (48 weeks).
Residual Risk Level:	**High**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	0	10,000	15,000
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

Worst Case: $7.5M per year (2 yrs) additional cost ($15M).

Most Likely Case: $5M per year (2 yrs) additional cost ($15M).

Best Case: No additional cost.

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	300,000	410,000	765,000
Residual Schedule Impact :	24 Wks	24 Wks	48 Wks

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: $7.5M per year (22 yrs) additional cost ($165M) and 2 weeks per year (24 yrs) schedule delay (48 weeks).

Most Likely Case: $5M per year (22 yrs) additional cost ($110M) and 1 week per year (24 yrs) schedule delay (24 weeks)

Best Case: No additional cost, but Program delay of 1 week/yr (24 weeks)

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
	300,000	420,000	780,000
Residual Schedule Impact :	24 Wks	24 Wks	48 Wks

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on total life cycle.

Risk Assumptions :

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 476 **Revision:** 00 **Last Date Evaluated:** 1/21/2016 **Status:** Active

Event Title: DWPF Flammability Issue Resolution Constrains Throughput			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste		
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations		
Responsible Org: SRR-ENG	**Contact:** Thomas Huff	**Date Identified:** 1/21/2016	
Statement of Event: A PISA is currently being resolved which relates to increased flammability while processing at DWPF. A risk exists that the resolution of this PISA results in curtailing operations at DWPF.			
Likelihood:	Very Unlikely	**Basis:** It is considered very unlikely that this risk will be realized as all indications are that the resolution of the PISA will be performed by accounting for the contribution of antifoam degradation products in the purge stream without requiring any additional limitations in production throughput.	
Consequence / Benefit:	Marginal	**Basis:** In the worst case production will be halted until alternate reductant deployment (six month impact).	
Most Significant Cost Impact ($k): 325,000	**Most Significant Schedule Impact :** 6 Mths		
Level:	**Low**	**Event Trigger:** Currently open; Close upon final resolution of DWPF PISA.	
Handling Strategy:	Accept	**Description:** Risk is accepted as PISA is currently being resolved.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 476 **Revision:** 00 **Last Date Evaluated:** 1/21/2016 **Status:** Active

Statement of Residual Risk: A risk remains that the resolution of this PISA results in curtailing operations at DWPF.

Residual Likelihood:	Very Unlikely	**Basis:** It is considered very unlikely that this risk will be realized as all indications are that the resolution of the PISA will be performed by accounting for the contribution of antifoam degradation products in the purge stream without requiring any additional limitations in production throughput.
Residual Consequence:	Marginal	**Basis:** In the worst case production will be halted until alternate reductant deployment (six month impact).
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 163,000	**Most Likely** 163,000	**Worst Case** 325,000
Residual Schedule Impact :	3 Mths	3 Mths	6 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: 6 months impact to DWPF production (and hence Program) until alternate reductant is deployed.

Most Likely Case and Best Case: During the resolution of the PISA, detailed calculations are performed which allow DWPF to continue operations after a 3 month shutdown.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 163,000	**Most Likely** 163,000	**Worst Case** 325,000
Residual Schedule Impact :	3 Mths	3 Mths	6 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Based on outyear impact only.

Risk Assumptions :

Event Comments:

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Risk Assessment Form

ID Number: 477 **Revision:** 01 **Last Date Evaluated:** 2/1/2016 **Status:** Active

Event Title: Multiple Flowsheet Changes Result in Processing Issues			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-ENG	**Contact:** Richard Edwards	**Date Identified:** 1/21/2016	
Statement of Event: Multiple flowsheet changes are currently planned and it is anticipated that others will be planned in the out years. A risk exists that the flowsheet changes when conducted in parallel, create unidentified issues which impact production at one or more of the Liquid Waste facilities.			
Likelihood:	Unlikely	**Basis:** Currently Alternate reductant is a major flowsheet change being deployed at DWPF and this flowsheet will also be subjected to changes based on modifications needed to accommodate an increased throughput from DWPF to meet SWPF waste processing rates (dry frit, SEFT to SME etc.,). The process of flowsheet development is an integrated and controlled process which evaluates the interaction of changes and validates each change relative to production goals (flowsheet volumes) and only allows deployment when a valid flowsheet has been developed. It is considered unlikely that this process will allow an oversight, however the assumption of adding a flowsheet modification without impacting throughput may not be valid during the planning phase, and flowsheet development could uncover an issue.		
Consequence / Benefit:	Marginal	**Basis:** In the worst case, alternate reductant (the most significant flowsheet change currently planned), is deployed and unforeseen processing issues arise. Safety basis will not be challenged, however, DWPF would be shut down for remediation (e.g. tank and system cleaning) for 6 months, and flowsheet changes made to resolve issues.	
Most Significant Cost Impact ($k): 325,000		**Most Significant Schedule Impact :** 6 Mths	
Level:	**Low**	**Event Trigger:** Open upon deployment of major flowsheet changes: Close upon successful deployment.	
Handling Strategy:	Accept	**Description:** This risk is accepted as strategies to technically mature and deploy changes in a controlled manner (e.g. thorough testing in phases, gradual deployment at low throughput etc.,) have either been completed or are in place to manage this risk.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: Perform an independent evaluation of the flowsheet by an external organization.			

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Risk Assessment Form

ID Number: 477 **Revision:** 01 **Last Date Evaluated:** 2/1/2016 **Status:** Active

Statement of Residual Risk: A risk remains that the flowsheet changes when conducted in parallel, create unidentified issues which impact production at one or more of the Liquid Waste facilities.

Residual Likelihood:	Unlikely	**Basis:** Currently Alternate reductant is a major flowsheet change being deployed at DWPF and this flowsheet will also be subjected to changes based on modifications needed to accommodate an increased throughput from DWPF to meet SWPF waste processing rates (dry frit, SEFT to SME etc.,). The process of flowsheet development is an integrated and controlled process which evaluates the interaction of changes and validates each change relative to production goals (flowsheet volumes) and only allows deployment when a valid flowsheet has been developed. It is considered unlikely that this process will allow an oversight, however the assumption of adding a flowsheet modification without impacting throughput may not be valid during the planning phase, and flowsheet development could uncover an issue.
Residual Consequence:	Marginal	**Basis:** In the worst case a technical issues is identified during the deployment process. In this case, alternate reductant (the most significant flowsheet change currently planned), is deployed and unforeseen processing issues arise. Safety basis will not be challenged, however, DWPF would be shut down for remediation (e.g. tank and system cleaning) for 6 months, and flowsheet changes made to resolve issues.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 163,000	**Worst Case** 325,000
Residual Schedule Impact :	1 Mth	3 Mths	6 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: 6 months impact to DWPF production (and hence Program) until system is remediated and facility restarted.

Most Likely Case: Time to perform administrative integration of multiple flowsheet changes (e.g. procedures, controls and phasing of deployment etc.,) exceeds the estimated duration up to 3 months.

Best Case: Time to perform administrative integration of multiple flowsheet changes (e.g. procedures, controls and phasing of deployment etc.,) exceeds the estimated duration up to 1 month.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 163,000	**Worst Case** 325,000
Residual Schedule Impact :	1 Mth	3 Mths	6 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Impact based on outyear consequences only.

Risk Assumptions :

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 479 **Revision:** 00 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Event Title: TCCR is Not Available When Planned			
Type: Risk, Internal, Technical	**Category:** Project Integration / Interfaces	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-PROJ	**Contact:** Pen Mayson	**Date Identified:** 1/28/2016	
Statement of Event: TCCR is planned for deployment on Tank 10 and will begin operation in December 2017. It will continue production through August 2018 and process ~800Kgals of salt waste. A risk exists that TCCR deployment is delayed.			
Likelihood:	Likely	**Basis:** This is a first of a kind deployment at SRS and historically these types of deployments have experienced delays (e.g. technical maturation and/or regulatory approval).	
Consequence / Benefit:	Negligible	**Basis:** In the worst case the deployment is delayed by seven months (four months lost processing), resulting in a reduction in the volume of salt waste being processed to 400Kgals. Not processing 400Kgals would result in extending the Program 2 weeks.	
Most Significant Cost Impact ($k): 25,000		**Most Significant Schedule Impact :** 2 Wks	
Level:	**Low**	**Event Trigger:** Open/close upon scheduled start of TCCR processing.	
Handling Strategy:	Accept	**Description:** Risk management and controls are being applied at the level to minimize the potential for delay.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 479 **Revision:** 00 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Statement of Residual Risk: A risk remains that TCCR deployment is delayed.

Residual Likelihood:	Likely	**Basis:** This is a first of a kind deployment at SRS and historically these types of deployments have experienced delays.	
Residual Consequence:	Negligible	**Basis:** In the worst case the deployment is delayed by four months, resulting in a reduction in the volume of salt waste being processed to 400Kgals. Not processing 400Kgals would result in extending the Program 2 weeks.	
Residual Risk Level:	**Low**		

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 12,500	**Worst Case** 25,000	Worst Case: Deployment is delayed 4 months, equivalent to 2 weeks Program delay. Most Likely and Best Case: Deployment is delayed 2 months, equivalent to 1 week Program delay.
Residual Schedule Impact :	1 Wk	1 Wk	2 Wks	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 12,500	**Worst Case** 25,000	Impact based on outyear consequences only.
Residual Schedule Impact :	1 Wk	1 Wk	2 Wks	

Risk Assumptions :

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 480 **Revision:** 00 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Event Title: TCCR Does not Perform as Required			
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-ENG	**Contact:** Mark Keefer	**Date Identified:** 1/28/2016	
Statement of Event: TCCR is planned to process 800Kgals of salt waste during its operational window. A risk exists that TCCR does not achieve the targeted processing volume.			
Likelihood:	Likely	**Basis:** This is a first of a kind deployment at SRS and historically these types of deployments have proven slower than baseline assumptions.	
Consequence / Benefit:	Negligible	**Basis:** In the worst case there is a reduction in the volume of salt waste being processed to 400Kgals. Not processing 400Kgals wouyld result in extending the Program 2 weeks.	
Most Significant Cost Impact ($k): 25,000		**Most Significant Schedule Impact :** 2 Wks	
Level:	**Low**	**Event Trigger:** Open upon scheduled start of TCCR processing; Close upon completion of TCCR processing	
Handling Strategy:	Accept	**Description:** Based on R&D and prototypical work performed or planned prior to deployment, this risk has been reduced as far as practical.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Risk Assessment Form

ID Number: 480 **Revision:** 00 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Statement of Residual Risk: A risk remains that TCCR does not achieve the targeted processing volume.

Residual Likelihood:	Likely	**Basis:** This is a first of a kind deployment at SRS and historically these types of deployments have proven slower than baseline assumptions.	
Residual Consequence:	Negligible	**Basis:** In the worst case there is a reduction in the volume of salt waste being processed to 400Kgals. Not processing 400Kgals would result in extending the Program 2 weeks.	
Residual Risk Level:	**Low**		

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 12,500	**Worst Case** 25,000	Worst Case: Reduction in processing capacity equivalent to 2 weeks Program delay. Most Likely and Best Case: Reduction in processing capacity equivalent to 1 week Program delay.
Residual Schedule Impact :	1 Wk	1 Wk	2 wks	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 12,500	**Most Likely** 12,500	**Worst Case** 25,000	Impact based on outyear consequences only.
Residual Schedule Impact :	1 Wk	1 Wk	2 wks	

Risk Assumptions :

Event Comments:

PBS SR-0014

Risk Assessment Form

ID Number: 481 **Revision:** 00 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Event Title: Downstream Flowsheet Impacts from TCCR Ion Exchange Media		
Type: Risk, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: SRR-ENG	**Contact:** Mark Keefer	**Date Identified:** 1/28/2016

Statement of Event: TCCR is planned to process 800Kgals of salt waste during its operational window using an ion exchage media. The current plan is to include this spent media in a sludge batch and process through DWPF. A risk exists that this material causes processing issues at DWPF.

Likelihood:	Very Unlikely	**Basis:** TCCR is being specifically designed to be compatible with DWPF processing and it is very unlikely that issues would arise during processing.
Consequence / Benefit:	Negligible	**Basis:** In the worst case, glass quality issues arise and it therefore has to be introduced into the sludge batch at a much lower rate, or at the end of the Program, resulting in additional expense for handling, and storage of media material. The additional costs could be up to $1M. It is assumed that no additional canisters would be produced due to balancing waste and TiO2 loadings (particularly at the end of the Program).

Most Significant Cost Impact ($k): 1,000	**Most Significant Schedule Impact :** 0

Level:	**Low**	**Event Trigger:** Open upon start of TCCR processing; Close upon completion of TCCR processing.
Handling Strategy:	Avoid	**Description:** Develop a Waste Incidental to Reprocessing (WIR) case for the disposition of the spent media off site and ship to a processing/disposal facility.

Handling Strategy Action Items:

481.1 Develop a WIR case for the disposition of the spent media off site, Larry Romanowski

481.2 Ship spent media to an off site processing/disposal facility., Mike Borders

HS Implementation Cost ($K):	0	**Basis:** Currently planned to perform this investigation.
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies: None

PBS SR-0014 **Risk Assessment Form**

ID Number: 481 **Revision:** 00 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Statement of Residual Risk: Risk has been avoided.				
Residual Likelihood:	N/A	**Basis:** N/A		
Residual Consequence:	N/A	**Basis:** N/A		
Residual Risk Level:				
NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:** N/A
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	
OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:** N/A
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	
LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:** N/A
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	
Risk Assumptions :				
Event Comments:				

PBS SR-0014 **Risk Assessment Form**

ID Number: 483 **Revision:** 00 **Last Date Evaluated:** 2/2/2016 **Status:** Active

Event Title: Coatings Applied to Interiors of SDUs 2, 3, 5 and 6 are Inadequate			
Type: Risk, Internal, Technical	**Category:** Design	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 5.1	**Assessable Element Title:** Grout Encapsulation of Waste		
WBS Number: 01.90.03.01	**WBS Title:** Saltstone Operations		
Responsible Org: SRR-ENG	**Contact:** Kent Fortenberry	**Date Identified:** 2/2/2016	
Statement of Event: A coating is applied to all SDUs to protect the concrete structure against sulphate attack. A risk exists that the coatings applied to SDUs 2, 3, 5 and 6 is determined to be inadequate in protecting the SDU structural concrete against sulphate attack.			
Likelihood:	Unlikely	**Basis:** Vendor specifications show the coatings are acceptable, however testing has not been performed for the bounding case.	
Consequence / Benefit:	Marginal	**Basis:** In the worst case testing shows that the coatings are inadequate and the closing of SDUs 2 and 3 would have to be performed as far as installation of the cold cap and a halt to SDU filling (5 and 6) of up to 6 months to develop a path forward (adjust grout recipe, place sacrificial grout etc.). The cost of cold cap is already considered as part of the Program.	
Most Significant Cost Impact ($k): 325,000		**Most Significant Schedule Impact :** 6 Mths	
Level:	**Low**	**Event Trigger:** Currently open; Close upon completion of Program or validation of coating protection.	
Handling Strategy:	Mitigate	**Description:** Peform testing of coating for bounding case and representative case prior to SWPF operations. This will result in a lessened impact if the risk is realized.	
Handling Strategy Action Items: 483.1 Peform testing (Cementitious Barrier Partnership) of coating for bounding case and representative case., Kent Fortenberry			
HS Implementation Cost ($K):	0	**Basis:** Testing is within the current baseline.	
HS Implementation Schedule:	0	**Basis:** No impact.	
Other Handling Strategies: None			

PBS SR-0014 **Risk Assessment Form**

ID Number: 483 **Revision:** 00 **Last Date Evaluated:** 2/2/2016 **Status:** Active

Statement of Residual Risk: A risk remains that the coatings applied to SDUs 2, 3, 5 and 6 is determined to be inadequate in protecting the SDU structural concrete against sulphate attack.

Residual Likelihood:	Unlikely	**Basis:** Vendor specifications show the coatings are acceptable, however testing has not been performed for the bounding case.
Residual Consequence:	Negligible	**Basis:** In the worst case testing shows that the coatings are inadequate and the closing of SDUs 2 and 3 would have to be performed as far as installation of the cold cap and a halt to SDU filling (5 and 6) of up to 6 months to develop a path forward (adjust grout recipe, place sacrificial grout etc.). The cost of cold cap is already considered as part of the Program. As the testing has allowed early identification (during the ARP/MCU campaign) the 6 months impact will be at the planned 1.5Mgals/yr rate, resulting in a 1.5/9x6 = 1 month Program delay.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 54,000	**Worst Case** 54,000	Worst and Most Likely Cases: One month delay to Program. Best Case: tests show the issue to be marginal and ARP/MCU operation is allowed to proceed until planned outage, at which point grout recipe is changed and remedial work is performed to SDUs.
Residual Schedule Impact :	0	1 Mth	1 Mth	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 54,000	**Worst Case** 54,000	Impact based on outyear consequences only.
Residual Schedule Impact :	0	1 Mth	1 Mth	

Risk Assumptions :

Event Comments:

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Risk Assessment Form

ID Number: 484 **Revision:** 00 **Last Date Evaluated:** 4/5/2016 **Status:** Active

Event Title: After Aluminum Dissolution, Remaining Aluminum Impacts Processing		
Type: Risk, Internal, Technical	**Category:** Technology	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 4.2	**Assessable Element Title:** Sludge Processing	
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations	
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 4/5/2016

Statement of Event: A desired sludge batch is composed of high Fe, low Al sludge. Higher Al sludge leads to a higher viscosity glass which leads to a decreased heat transfer in the melt pool with a resulting decreased melt rate. DWPF is designed to process a variety of sludge batch compositions due to its ability to adjust with different frits. During sludge batch processing, sample results indicate high aluminum concentration even after aluminum dissolution which would lead to lower canister production rates.

Likelihood:	Unlikely	**Basis:** Recent WCS evaluations have shown that some future SBs will have higher aluminum concentrations than desired. Recent data from Sludge Batch 5 and Sludge Batch 6 aluminum dissolution and Tank 12 heel dissolution shows successful dissolution was achieved.
Consequence / Benefit:	Significant	**Basis:** As part of the existing program, laboratory analysis is performed to determine the sludge batch chemistry and the corresponding frit type that will optimize canister production. Even with this optimization, low waste loading results from high Al concentration and more canisters are required resulting in a longer processing time for the sludge batch. Assuming all remaining H-Area sludge batches have high Al, the extension to the overall sludge processing program would be up to 1 year. The end date for sludge processing will be extended and this will impact the program end date up to an additional year.

Most Significant Cost Impact ($k): 650,000	**Most Significant Schedule Impact :** 1 Yr

Level:	**Moderate**	**Event Trigger:** Currently open; Close on completion of DWPF processing H-Area sludge.
Handling Strategy:	Mitigate	**Description:** As part of the current program, frits are investigated continually for process improvements as well as qualification for each sludge batch. Determine, through dissolution, the quantity of different forms of aluminum in the waste stream for each sludge batch. Optimize batch chemistry by investigating and employing batch management. The use of bubblers in the Melter has demonstrated some ability to relieve the melt pool heat transfer reduction due to the increased Al concentration. Also, batch management (combining F and H area sludge) is used in sludge batch planning.

Handling Strategy Action Items:

HS Implementation Cost ($K):	0	**Basis:** The costs are within the current baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: Determine the stability of Al leachate streams and downstream impacts. Perform actual waste testing of sludge mass reducion techniques. Develop technology for the removal of higher fractions of boehmite.

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Risk Assessment Form

ID Number: 484 **Revision:** 00 **Last Date Evaluated:** 4/5/2016 **Status:** Active

Statement of Residual Risk: Significant levels of residual undissolved aluminium sludge are very unlikely to exist after aluminum dissolution process is deployed, however, frit development efforts and melter bubbler installation may help compensate for detrimental program impacts.

Residual Likelihood:	Very Unlikely	**Basis:** Aluminum dissolution and other process optimization strategies reduce the likelihood of this event to very unlikely.
Residual Consequence:	Marginal	**Basis:** Residual impacts based on risk having out-year consequences of 6 months extension to sludge processing.
Residual Risk Level:	**Low**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

N/A

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 163,000	**Worst Case** 325,000
Residual Schedule Impact :	1 Mth	3 Mths	6 Mths

Basis of OUT YEAR Cost and Schedule Impacts:

Worst Case: Residual impacts based on risk having out-year consequences of 6 mths extension to sludge processing.

Most Likely Case: Residual impacts based on risk having out-year consequences of 3 months extension to sludge processing.

Best Case: Residual impacts based on risk having out-year consequences of 1 month extension to sludge processing.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** 54,000	**Most Likely** 163,000	**Worst Case** 325,000
Residual Schedule Impact :	1 Mth	3 Mths	6 Mths

Basis of LIFE CYCLE Cost and Schedule Impacts:

Residual impact based on risk having out-year consequences only.

Risk Assumptions :

DWPF canister production and sludge batch need dates are projected by the Sludge Batch Plan.

Event Comments:

ACTIVE OPPORTUNITIES

PBS SR-0014

Opportunity Assessment Form

ID Number: 173 **Revision:** 05 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Feedback from Technical Successes to DOE Complex (DOE Opportunity)			
Type: Opportunity, Internal, Programmatic	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization & Disposition		
Responsible Org: SRR-ENG	**Contact:** Kent Fortenberry	**Date Identified:** 6/15/2006	
Statement of Event: Technology developed during the execution of PBS-SR-0014 e.g. cleaning and closure, vitrification, grout stabilization technologies etc., could be used elsewhere in the complex.			
Likelihood:	Very Likely	**Basis:** The complex will be performing tank closures and liquid waste processing and stabilization. SRS will be on the cutting edge of many technical developments. Also as technical approaches are tested and lessons learned at other sites, a body of knowledge is being gathered within the complex.	
Consequence / Benefit:	Significant	**Basis:** Although a vast body of knowledge is being developed (both at DOE sites, commercial nuclear facilities and facilities and other countries' complexes worldwide), no singular formal process has been established to ensure knowledge is becoming accessible to all DOE sites. By coordinating this information, technology developments and lessons learned can be shared. Applying this knowledge to SRS activities could result in schedule reductions and cost benefits. Benefits are difficult to estimate and for purposes of benchmarking this opportunity savings of $5M and Program reduction of 1 Mth are estimated.	
Most Significant Cost Impact ($k): (59,000)		**Most Significant Schedule Impact :** (1 Mth)	
Level:	**High**	**Event Trigger:** N/A	
Handling Strategy:	Accept	**Description:** Currently several mechanisms exist and are being exercised to share technical information e.g. Tank Waste Corporate Board, also ad-hoc technology exchanges are continuing as part of ongoing business (e.g. Waste Management Conference, EM-TEG, EM-TD Program, SRR hosted exchanges etc.). Moving expertise to sites temporarily/permanently: bringing in expertise from other sites; Chief Engineer regularly scheduled telecons. Technologies developed are being shared between sites. Position of Technology Officer has been established within SRR.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** Current baseline budget has provision for technology exchange activities.	
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.	
Other Handling Strategies: Develop a complex-wide plan to collect and document technical successes and disseminate this information to the DOE complex for the life cycle of the PBS.			

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Opportunity Assessment Form

ID Number: 173 **Revision:** 05 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: An opportunity exists to collect and document technical successes and to disseminate this information to the DOE complex.

Residual Likelihood:	Very Likely	**Basis:** The complex will be performing tank closures and liquid waste processing and stabilization. SRS will be on the cutting edge of many technical developments. Also as technical approaches are tested and lessons learned at other sites, a body of knowledge is being gathered within the complex.
Residual Consequence:	Significant	**Basis:** Although a vast body of knowledge is being developed, no singular formal process has been established to ensure knowledge is becoming accessible to all DOE sites. By coordinating this information, technology developments and lessons learned can be shared. Applying this knowledge to SRS activities could result in schedule reductions and cost benefits. Benefits are difficult to estimate and for purposes of benchmarking this opportunity savings of $5M and Program reduction of 1 Mth are estimated.
Residual Risk Level:	**High**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (59,000)	**Most Likely** (28,000)	**Worst Case** (14,500)	Best Case: A program reduction of 1 month and Savings of $5M is realized. Most Likely: A program reduction of 2 weeks and Savings of $3M is realized. Worst Case: A program reduction of 1 week and Savings of $2M is realized.
Residual Schedule Impact :	(1 Mth)	(2 Wks)	(1 Wk)	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (59,000)	**Most Likely** (28,000)	**Worst Case** (14,500)	Benefit based on outyear impact only.
Residual Schedule Impact :	(1 Mth)	(2 Wks)	(1 Wk)	

Risk Assumptions :

Event Comments: This is a cross-cutting opportunity.

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Opportunity Assessment Form

ID Number: 208 **Revision:** 07 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Improvements in Waste Removal			
Type: Opportunity, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 8.0	**Assessable Element Title:** General and Crosscutting Functions/Risks		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-ENG	**Contact:** John Occhipinti	**Date Identified:** 5/17/2007	
Statement of Event: Waste removal as currently planned, takes years and requires specialized equipment, complex processes and a large number of transfer operations within in the LW System. An opportunity exists that improvements to this process could be identified and used to reduce the cost and duration of the Program.			

Likelihood:	Likely	**Basis:** Preliminary investigations have indicated there are could be possibilities to reduce liquid additions improve mixing, pumping and transfer campaigns and reduce operational durations.
Consequence / Benefit:	Significant	**Basis:** Improvements could gain tank space earlier and for less expenditure. This removes processing constraint and will result in accelerated waste removal, processing and closure. The benefit is estimated to have a potential of accelerating the durations of tank closure cumulatively up to 1 Yr (no Program schedule gain, however a cost savings of up to $25M).

Most Significant Cost Impact ($k): (25,000)	**Most Significant Schedule Impact :** 0

Level:	**Moderate**	**Event Trigger:** N/A
Handling Strategy:	Enhance	**Description:** Reviews of the results of waste removal activities/lessons learned have identified and are continuing to identify improvements for improving waste removal (Those that would reduce the amount of liquid additions and speed up the waste removal process, reduce the cost of waste removal equipment or operation and plan development of those improvements e.g. recirculation techniques, use of other waste streams). Investigate and deploy mixing techniques with limited material (level of several inches only) within the tank.

Handling Strategy Action Items:

208.6 Procure and deploy new mixing techniques (e.g. new pumps to allow mixing at lower levels)., John Occhipinti

HS Implementation Cost ($K):	0	**Basis:** Identified improvements are within the baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: None

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Opportunity Assessment Form

ID Number: 208 **Revision:** 07 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: Activities are identified which reduce the amount of liquid needed and which improve and speed the waste removal process. The result is a reduction in the cost of waste removal.

Residual Likelihood:	Very Likely	**Basis:** Preliminary investigations have indicated there are possibilities to reduce liquid additions and operational durations. And by deploying new mixing technologies the likelihood has increased to very likely.
Residual Consequence:	Significant	**Basis:** Improvements could gain tank space earlier and for less expenditure. This removes processing constraint and will result in accelerated waste removal, processing and closure. The benefit is estimated to have a potential of accelerating the durations of tank closure cumulatively up to 1 Yr (no Program schedule gain, however a cost savings of up to $25M).
Residual Risk Level:	**High**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (25,000)	**Most Likely** (15,000)	**Worst Case** (10,000)	Best Case: $25M savings is realized with zero schedule gain. Most Likely: $15M savings is realized with zero schedule gain. Worst Case: $10M Savings is realized with zero schedule gain.
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (25,000)	**Most Likely** (15,000)	**Worst Case** (10,000)	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments:

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Opportunity Assessment Form

ID Number: 224 **Revision:** 09 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Improvements in Closure		
Type: Opportunity, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences
Assessable Element : 6.0	**Assessable Element Title:** Closure (Tanks, Evap. & Ancil. Equip) Including Heel Removal	
WBS Number: 01.90.01	**WBS Title:** Waste Removal and Tank Closure	
Responsible Org: SRR-CL	**Contact:** Janice Williams	**Date Identified:** 6/12/2007

Statement of Event: Tank closure has been performed on seven tanks to date. Regulatory changes have been imposed which force different approaches to be used to achieve the closure of tanks, evaporators and ancillary equipment. An opportunity exists that by examining data, lessons learned and exploring opportunities for technical improvements closure activities could be enhanced. Additionally the methods of characterizing residual material, development of closure documentation, reviews etc., may also be streamlined using lessons from implementing closure of tanks.

Likelihood:	Likely	**Basis:** New approaches have been implemented however, some measure of optimization is yet to be achieved through continual investigation into improvements.
Consequence / Benefit:	Significant	**Basis:** Although this cannot be well-defined at this point, favorable results could cumulatively reduce the tank closure campaign up to 1 year over its life. This will not provide any relief to the end date of the Program, but could reduce closure costs up to $25M.

Most Significant Cost Impact ($k): (25,000) **Most Significant Schedule Impact :** 0

Level:	**Moderate**	**Event Trigger:** N/A
Handling Strategy:	Enhance	**Description:** It has been established as part of the SRR program that DOE complex-wide conferences are attended by representatives from SRS to share knowledge, experiences and improve the ability to execute the closure program. Examine data, lessons learned and explore opportunities for technical improvements in closure activities. Apply LEAN techniques to streamline the closure documentation process and field implementation. Streamlining of sample analysis by SRNL could be employed. Modify tank isolation and grout formulation approach in Consolidated General Closure Plan (for both Tank Farms).

Handling Strategy Action Items:

224.1 Modify the interpretation of tank isolation to allow the limited use of ventilation systems and avoid the cost of installing temporary ventilation. Include in Consolidated General Closure Plan (for both Tank Farms)., Ty Blackford

224.2 Develop an alternate grout formula for bulk fill with improved stabilization characteristics to allow more efficient closure (e.g. single riser placement, etc.) and include in Consolidated General Closure Plan (for both Tank Farms)., Ty Blackford

HS Implementation Cost ($K):	0	**Basis:** This activity is within the current baseline.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: Develop a DOE complex wide database for experience in closure activities. Review and evaluate data to improve the development of annulus cleaning technologies.

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Opportunity Assessment Form

ID Number: 224 **Revision:** 09 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: Examination of the Tank Closure activities to date, have shown opportunities to streamline and improve the cleaning and closure process.

Residual Likelihood:	Very Likely	**Basis:** The new approaches have been implemented however, additional optimization can be achieved. After implementation of process improvements likelihood has increased, however remains likely.
Residual Consequence:	Significant	**Basis:** Although this cannot be well-defined at this point, favorable results could cumulatively reduce the tank closure campaign up to 1 year over its life. This will not provide any relief to the end date of the Program, but could reduce closure costs up to $25M.
Residual Risk Level:	**High**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	
	0	0	0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Best Case: $25M reduction in closure costs with zero schedule gain.
	(25,000)	(15,000)	(10,000)	Most Likely: $15M reduction in closure costs with zero schedule gain.
Residual Schedule Impact :	0	0	0	Worst Case: $10M reduction in closure costs with zero schedule gain.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Impact based on outyear benefits.
	(25,000)	(15,000)	(10,000)	
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments:

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Opportunity Assessment Form

ID Number: 226 **Revision:** 08 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Event Title: Influent Reductions			
Type: Opportunity, Internal, Programmatic	**Category:** Project Integration / Interfaces	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 1.0	**Assessable Element Title:** Receive Liquid Radioactive Waste		
WBS Number: 01.90.02.01	**WBS Title:** F-H Tank Farm Facilities		
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 6/12/2007	
Statement of Event: Influents into the Tank Farm will be received throughout the life of PBS-SR-0014. An opportunity exists that by reducing the volume of influents into the Tank Farm, the amount of waste requiring treatment is less and the Program duration could be reduced.			
Likelihood:	Likely	**Basis:** Flowsheets within the Canyon are being optimized to minimize volume of waste. Incremental reductions have been achieved e.g. neptunium transfers. Transfers of materials approaching the influent planned limit of 300,000 gallons are being planned. Water added to Tank Farms from internal sources (rainwater intrusion, evaporator flush water etc.) could also be reduced.	
Consequence / Benefit:	Exceptional	**Basis:** Although this cannot be well-defined at this point, favorable results could reduce the tank closure campaign up to 3 mths over its life and similarly reduce the volume of salt processed/saltstone produced.	
Most Significant Cost Impact ($k): (163,000)		**Most Significant Schedule Impact :** (3 Mths)	
Level:	**High**	**Event Trigger:** N/A	
Handling Strategy:	Accept	**Description:** As part of the current program, flowsheets are reviewed to identify and implement methods to minimize waste volumes sent to the Tank Farms. Results of these ongoing reviews feed the System Plan and feedback is provided to the M&O for Canyon operations planning. Investigate potential reductions in internal water additions (e.g. rainwater, evaporator flushing etc.). Evaluate the need to initiate a formal study during annual updates based on plant condition.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** Costs would be to Canyon PBS.	
HS Implementation Schedule:	N / A	**Basis:** Would be included in Canyon PBS schedule.	
Other Handling Strategies: None			

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Opportunity Assessment Form

ID Number: 226 **Revision:** 08 **Last Date Evaluated:** 1/12/2016 **Status:** Active

Statement of Residual Risk: By reducing the volume of influents into the Tank Farm, the amount of waste requiring treatment is less and the program duration could be reduced.

Residual Likelihood:	Likely	**Basis:** Flowsheets within the Canyon are being optimized to minimize volume of waste. Incremental reductions have been achieved e.g. neptunium transfers. Transfers of materials approaching the influent planned limit of 300,000 gallons are being planned. Water added to tank farms from internal sources (rainwater intrusion, evaporator flush water etc.) could also be reduced.
Residual Consequence:	Exceptional	**Basis:** Although this cannot be well-defined at this point, favorable results could reduce the tank closure campaign up to 3 mths over its life and similarly reduce the volume of salt processed/saltstone produced.
Residual Risk Level:	**High**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (163,000)	**Most Likely** (108,000)	**Worst Case** (54,000)	Best Case: Savings of $163M (up to 3 months schedule improvement) may be realized. Most Likely: Savings of $108M (2 month schedule improvement) may be realized. Worst Case: Savings of $54M (1 month schedule improvement) may be realized.
Residual Schedule Impact :	(3 Mths)	(2 Mths)	(1 Mth)	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (163,000)	**Most Likely** (108,000)	**Worst Case** (54,000)	Impact based on outyear benefits.
Residual Schedule Impact :	(3 Mths)	(2 Mths)	(1 Mth)	

Risk Assumptions :

Event Comments:

PBS SR-0014

Opportunity Assessment Form

ID Number: 227 **Revision:** 08 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Waste Characterization Improvements			
Type: Opportunity, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.0	**Assessable Element Title:** Process Radioactive Waste		
WBS Number: 01.30.03	**WBS Title:** Waste Treatment		
Responsible Org: SRR-ENG	**Contact:** Richard Edwards	**Date Identified:** 6/12/2007	
Statement of Event: An opportunity exists that improved characterization of waste streams will allow an optimum processing flowsheet that maximizes throughput for all facilities.			

Likelihood:	Likely	**Basis:** Developing additional tools to augment WCS and integrating their use as part of the overall characterization plan is likely to improve the characterization of waste streams.
Consequence / Benefit:	Marginal	**Basis:** Although this cannot be well-defined at this point, favorable results could reduce the cost of salt batch and sludge batch preparation. Additionally this could provide further data which could be used in refining Facility DSAs and reducing the cost of controls. This opportunity also has the potential for reducing laboratory analysis work. Based on these factors a cost savings may be achieved by reducing sampling and analysis. At this time the benefit cannot be fully quantified, however it is anticipated to be up to $10M savings over the life of the program.
Most Significant Cost Impact ($k): (10,000)		**Most Significant Schedule Impact :** 0
Level:	**Moderate**	**Event Trigger:** N/A
Handling Strategy:	Enhance	**Description:** Investigate, develop and deploy new and improved tools to augment the current waste characterization program. Develop and validate a WCS upgrade to facilitate automatic projection of waste stream compositions based on planned transfer modeling. Improvements in WCS could help handle other risks where waste compositional variances and unknowns exist.

Handling Strategy Action Items:

227.1 Investigate existing sampling program and recommend improvements to the current waste characterization program., Ryan McNew

227.2 Develop and validate a WCS upgrade to facilitate automatic projection of waste stream compositions based on planned transfer modeling., Susan Lawson

227.3 Deploy new and improved tools to augment the current waste characterization program., Jason Vitali

HS Implementation Cost ($K):	0	**Basis:** WCS upgrade was identified and is being executed. It is assumed that as other tools are identified, they will be included to achieve the benefit to the Program.
HS Implementation Schedule:	0	**Basis:** Completed within the schedule baseline.

Other Handling Strategies: Develop, test and deploy a Raman based probe for in tank hydroxide, nitrate and nitrite measurement. Develop models to predict actinide solubilities. Develop in situ rheology measurement techniques.

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Opportunity Assessment Form

ID Number: 227 **Revision:** 08 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: Review of the existing sampling program and waste characterization program indicate the potential for cost savings through improvements in sampling and implementation of new waste characterization tools and software combined with WCS upgrades can optimize process flow sheets and maximize throughputs for all facilities.

Residual Likelihood:	Very Likely	**Basis:** Developing additional tools to augment WCS and integrating their use as part of the overall characterization plan is likely to improve the characterization of waste streams. Implementation of these tools has increased the likelihood to very likely.
Residual Consequence:	Significant	**Basis:** Although this cannot be well-defined at this point, favorable results could reduce the cost of salt batch and sludge batch preparation. Additionally this could provide further data which could be used in refining Facility DSAs and reducing the cost of controls. This opportunity also has the potential for reducing laboratory analysis work. Based on these factors a cost savings may be achieved by reducing sampling and analysis. At this time the benefit cannot be fully quantified, however it is anticipated to be up to $10M savings over the life of the Program.
Residual Risk Level:	**High**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	N/A
	0	0	0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Best Case: A savings of $10M may be realized.
	(10,000)	(5,000)	(2,500)	Most Likely: A savings of $5M may be realized.
Residual Schedule Impact :	0	0	0	Worst Case: A savings of $2.5 M may be realized.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Impact based on outyear benefits.
	(10,000)	(5,000)	(2,500)	
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments:

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Opportunity Assessment Form

ID Number: 384 **Revision:** 04 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Develop Approved Final Disposal Paths for DWPF Failed Equipment			
Type: Opportunity, External, Programmatic	**Category:** Project Integration / Interfaces	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste		
WBS Number: 01.90.02.01	**WBS Title:** DWPF Operations		
Responsible Org: DOE-SR	**Contact:** Jean Ridley	**Date Identified:** 8/11/2011	

Statement of Event: Currently at DWPF, failed Melters and failed equipment are stored in boxes within underground Failed Equipment Storage Vaults (FESVs). As equipment fails, more FESVs are built to provide additional storage. None of the stored equipment is being disposed of at this time. An opportunity exists to develop a path to final disposition for failed equipment and avoid the need to construct additional FESVs.

Likelihood:	Unlikely	**Basis:** While this would be a long-term life-cycle savings, it is unlikely that near-term funding could be secured to develop the necessary disposition pathway, both within PBS-SR-0014 and PBS-SR-0030. (Refer to Risk 027)
Consequence / Benefit:	Significant	**Basis:** Savings would be approximately 2M per vault (1 unit = 2 vaults). Assuming 5 units (10 vaults) will be required over the life cycle of PBS-SR-0014, approximately $20M could be saved. No savings in Program duration would be realized, but PBS-SR-0030 life cycle may be shortened if DWPF failed equipment disposition activities lie on the critical path to completion.

Most Significant Cost Impact ($k): (20,000) **Most Significant Schedule Impact :** 0

Level:	**Moderate**	**Event Trigger:** N/A
Handling Strategy:	Share	**Description:** Evaluate this opportunity as an inter-PBS opportunity. By allowing the final disposition early, the life cycle of the final SRS closure PBS (30) would be reduced. Review possibility of dispositioning DWPF Melter in a prequalified transportation box as LLW.

Handling Strategy Action Items:

384.1 Develop a methodology and PBS-SR-0014 business case for early disposal of failed DWPF equipment. (unfunded), George Matis

384.2 Develop a methodology and PBS-SR-0030 business case for early disposal of failed DWPF equipment. (unfunded), To Be Assigned

384.3 Make a decision based on the business cases presented for PBS-SR-0014 and 030, to further develop and implement final disposal paths or perform disposal at the end of PBS-SR-0014., DOE - Jean Ridley

HS Implementation Cost ($K):	0	**Basis:** This is not a near-term plan, but should be considered in the outyears.
HS Implementation Schedule:	0	**Basis:** No impact to schedule as these would be parallel activities.

Other Handling Strategies: None

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Opportunity Assessment Form

ID Number: 384 **Revision:** 04 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: Early permanent disposal of failed equipment from DWPF could provide a long term life cycle savings. This would be accomplished by not building the FESVs at DWPF for temporary storage and allowing for permanent disposition of failed equipment now. Current plans include final disposition of failed DWPF equipment with the final SRS closure.

Residual Likelihood:	Unlikely	**Basis:** While this would be a long-term life-cycle savings, it is unlikely that near-term funding could be secured to develop the necessary disposition pathway, both within PBS-SR-0014 and PBS-SR-0040. (Refer to Risk 027)
Residual Consequence:	Significant	**Basis:** Savings would be approximately 2M per vault (1 unit = 2 vaults). Assuming 5 units (10 vaults) will be required over the life cycle of PBS-SR-0014, approximately $20M could be saved. No savings in life cycle for PBS-SR-0014 would be realized, but PBS-SR-0030 life cycle may be shortened if DWPF failed equipment disposition activities lie on the critical path to completion.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (20,000)	**Most Likely** (20,000)	**Worst Case** (20,000)	A savings of $20M may be realized. This savings would not be realized in PBS-SR-0014. No schedule gain has been identified.
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (20,000)	**Most Likely** (20,000)	**Worst Case** (20,000)	Benefit based on outyear impact only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments: This is an interfacing opportunity with PBS-SR-0030.

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Opportunity Assessment Form

ID Number: 385 **Revision:** 04 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Re-Define Final Vitrified Wasteform Requirements			
Type: Opportunity, External, Technical	**Category:** Regulatory and Environmental	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste		
WBS Number: 01.90.02.01	**WBS Title:** DWPF Operations		
Responsible Org: DOE-SR	**Contact:** Jean Ridley	**Date Identified:** 8/11/2011	

Statement of Event: Glass wasteform requirements were developed through integrating projected DWPF glass wasteform characteristics (e.g. waste loading) with the permitting of Yucca Mountain as it related to pre-closure and post closure. It is no longer planned to utilize Yucca Mountain as the Nation's HLW Federal Repository and subsequently the Project has been cancelled. An opportunity exists that the requirements of Yucca Mountain may no longer need to be imposed on the DWPF Wasteform. A set of new DWPF Glass wasteform requirements could be developed (e.g. a greater fissile waste loading) which optimize production and balance the maximum throughput of DWPF against the ability to pretreat waste within the HLW System.

Likelihood:	Unlikely	**Basis:** Although Yucca mountain is no longer targeted as the Federal Repository, no other repository has been identified. Therefore, to raise the fissile loading of the glass wasteform could result in limiting the options open for final disposition of the canistered wasteform. It is unlikely that this would be approved by the applicable Government office.
Consequence / Benefit:	N/A	**Basis:** This opportunity would not have any significant savings on the current life cycle, other than providing DWPF with a greater degree of operational flexibility. However, a higher allowable fissile loading would allow the disposition of additional material such as Pu without any significant impact on the life cycle of PBS-SR-0014.

Most Significant Cost Impact ($k): N/A **Most Significant Schedule Impact :** N/A

Level:		**Event Trigger:** N/A
Handling Strategy:	Share	**Description:** Develop a business case for the glass wasteform by establishing higher fissile waste loading, Ti limits, Al concentration, etc. Gain acceptance of DOE-HQ and applicable government office.

Handling Strategy Action Items:

385.1 Develop a business case for the glass wasteform by establishing a higher fissile waste loading, Ti limits, Al concentration, etc. Gain acceptance of DOE-HQ and applicable government office., Jeff Ray

HS Implementation Cost ($K):	0	**Basis:** No additional cost.
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies: None

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Opportunity Assessment Form

ID Number: 385 **Revision:** 04 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: A set of new DWPF Glass wasteform requirements could be developed with a greater fissile waste loading, which optimize production and balance the maximum throughput of DWPF against the ability to pretreat waste within the HLW System. This could result in limiting the options open for final disposition of the canistered wasteform. It is unlikely that this would be approved by the applicable Government office.

Residual Likelihood:	Unlikely	**Basis:** Yucca mountain is no longer targeted as the Federal Repository, no other repository has been identified. Therefore, to raise the fissile loading of the glass wasteform could result in limiting the options open for final disposition of the canistered wasteform. It is unlikely that this would be approved by the applicable government office.
Residual Consequence:	N/A	**Basis:** This opportunity would not have any significant savings on the current life cycle, other than providing DWPF with a greater degree of operational flexibility. However, a higher allowable fissile loading would allow the disposition of additional material such as Pu without any significant impact on the life cycle of PBS-SR-0014.
Residual Risk Level:		

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	No cost or schedule savings have been identified.
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments: This is an interface opportunity with the DOE Office(s) responsible for the Federal Repository Project.

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Opportunity Assessment Form

ID Number: 389 **Revision:** 06 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Event Title: Reduce Future Closure Requirements			
Type: Opportunity, Internal, Technical	**Category:** Regulatory and Environmental	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 6.0	**Assessable Element Title:** Closure (Tanks, Evap. & Ancil. Equip) Including Heel Removal		
WBS Number: 01.90.01	**WBS Title:** Waste Removal and Tank Closure		
Responsible Org: SRR-CL	**Contact:** Janice Williams	**Date Identified:** 1/10/2012	
Statement of Event: Currently tank closure requirements are defined within the baseline and may increase (based on risks defined elsewhere). There is an opportunity to reduce requirements as tank closures are completed and confidence in the PA results increases.			
Likelihood:	Likely	**Basis:** In the early stages of tank closure this was considered unlikely. However, further into the program this is becoming more likely based on data collected.	
Consequence / Benefit:	Significant	**Basis:** A cost savings of up to 10% on each tank (at 10% of $30M/tank and the last 16 tanks) resulting in $48M savings for the program.	
Most Significant Cost Impact ($k): (48,000)		**Most Significant Schedule Impact :** 0	
Level:	**Moderate**	**Event Trigger:** N/A	
Handling Strategy:	Exploit	**Description:** The data required to support the arguments for reducing requirements is currently being gathered and will continue being gathered. MEP decisions and their bases are being refined as the full cost (safety, exposure, downstream processing, etc.) and benefits gained are more fully understood. Sampling requirements may be able to be reduced based on historical data.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** No additional cost.	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: None			

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Opportunity Assessment Form

ID Number: 389 **Revision:** 06 **Last Date Evaluated:** 1/25/2016 **Status:** Active

Statement of Residual Risk: As tank closures are completed and confidence in the PA results increases, requirements for future tank closures may be reduced.

Residual Likelihood:	Likely	**Basis:** In the early stages of tank closure this is considered unlikely. However, further into the program this may become more likely based on data collected.
Residual Consequence:	Significant	**Basis:** A cost savings of up to 10% on each tank (at 10% of $30M/tank and the last 16 tanks) resulting in $48M savings for the Program.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (48,000)	**Most Likely** (48,000)	**Worst Case** (48,000)	All Cases: A savings of $48M may be realized. No schedule gain is identified.
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (48,000)	**Most Likely** (48,000)	**Worst Case** (48,000)	Benefit based on outyear impact only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments:

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Opportunity Assessment Form

ID Number: 393 **Revision:** 03 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Event Title: Operation of NGS at Higher Sodium Molarity		
Type: Opportunity, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 4.1.2	**Assessable Element Title:** SWPF Salt Processing	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: DOE-SR	**Contact:** Pat Suggs	**Date Identified:** 1/18/2012

Statement of Event: Next Generation Solvent R&D has shown promising distribution data for the performance of the NG-CSSX solvent at elevated sodium concentration in that the cesium extraction strength be maintained at higher sodium concentrations while not impairing scrubbing or stripping. An opportunity exists that by increasing Na molarity in feed to SWPF saltcake can be processed at a faster rate. The incoming feed (salt batch) will be of an increased Na molarity from the current 6.4 to 8. The DSS would be increased (from 5.2 to 6.4) but remain below the Saltstone WAC limit of 7.

Likelihood:	Likely	**Basis:** Based on preliminary R&D results, the distribution coefficients support successful operation of NGS at up to 20% increased Na molarity. Parsons Test Report for higher sodium feeds "Next Generation Solvent Test Report Including a Higher Concentration Waste Demonstration", P-RPT-J-00028, Rev 0, 03/02/2015 observed satisfactory results up to 7.5 M Na. This is 34% (7.5M / 5.6M) more concentrated than the technical baseline of 5.6 M. Actual operations would more likely use 6.4 M which would result in a 14% reduction in overall salt feed volume once employed.
Consequence / Benefit:	Exceptional	**Basis:** A smaller volume of salt feed would be required to be processed. This reduces the volume of DSS, reducing the SDU space required. Additionally the effect of processing at the same throughput, a reduced volume results in salt processing completing earlier, an opportunity would therefore be available to shorten the life cycle duration. Assuming 1 large SDU is avoided, a maximum cost savings of $125M could be achieved along with a reduction in SWPF duration of operation (up to 2 years) by completing the processing salt earlier. Two years at $80M/yr for SWPF operations savings.

Most Significant Cost Impact ($k): 285,000	**Most Significant Schedule Impact :** 0

Level:	**High**	**Event Trigger:** N/A
Handling Strategy:	Enhance	**Description:** Investigate further processing at a higher Na molarity and develop a path forward for testing using full-scale equipment and validation before deployment. Perform alternative analysis to identify a recommended facility modification to permit switching flowsheet to NGS and provide direction to EPC to begin implementation by performing a conceptual design.

Handling Strategy Action Items:

393.1 Investigate further processing at a higher Na molarity and develop a path forward for testing and validation before deployment. (including increased Iodine concentrations in saltstone), Keith Harp

393.2 Evaluate Saltstone grout formulations at higher Na molarities if encroaching on WAC limit., Keith Harp

393.3 Investigate increasing feed to SWPF to support maximum throughput under 7 molar feed to SPF (Reference report P-RPT-J-00024) i.e., achievability of a ~8 Na molar salt batch., Keith Harp

HS Implementation Cost ($K):	0	**Basis:** Cost of testing is not within current baseline, but is anticipated to be planned.
HS Implementation Schedule:	0	**Basis:** No impact to schedule.

Other Handling Strategies: None

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Opportunity Assessment Form

ID Number: 393 **Revision:** 03 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Statement of Residual Risk: An opportunity exists that by increasing Na molarity in feed to SWPF saltcake can be processed at a faster rate.

Residual Likelihood:	Likely	**Basis:** Based on preliminary R&D results, the distribution coefficients support successful operation of NGS at up to 20% increased Na molarity.
Residual Consequence:	Exceptional	**Basis:** A smaller volume of salt feed would be required to be processed. This reduces the volume of DSS, reducing the SDU space required. Additionally the effect of processing at the same throughput, a reduced volume results in salt processing completing earlier, an opportunity would therefore be available to shorten the life cycle duration. Assuming 1 large SDU is avoided, a maximum cost savings of $125M could be achieved along with a reduction in SWPF duration (up to 2 years) by completing the processing salt earlier.
Residual Risk Level:	**High**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (285,000)	**Most Likely** (80,000)	**Worst Case** (40,000)	Best Case: A savings of $125M and a reduction in SWPF operation duration of 2 years is achieved. (125 + 2x80) Most Likely Case: No SDU savings, but a reduction in SWPF duration of 1 year is achieved.(2x80) Worst Case: No SDU savings, but a reduction in SWPF duration of 6 months is achieved. (0.5x80)
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (285,000)	**Most Likely** (80,000)	**Worst Case** (40,000)	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments:

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Opportunity Assessment Form

ID Number: 423 **Revision:** 03 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Event Title: Higher Molarity Sludge Processing			
Type: Opportunity, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 5.2	**Assessable Element Title:** Vitrification of Waste		
WBS Number: 01.90.03.01	**WBS Title:** DWPF Operations		
Responsible Org: SRR-ENG	**Contact:** Richard Edwards	**Date Identified:** 4/24/2013	
Statement of Event: An opportunity exists that the deployment of Alternate Reductant may allow processing of higher Na molarity sludge to DWPF.			
Likelihood:	Likely	**Basis:** DWPF limits the production of hydrogen in the SRAT from acid addition. Higher molarity feeds may be possible when using alternate reductant since the acid addition calculation will not be limited by the hydrogen production.	
Consequence / Benefit:	Marginal	**Basis:** By being able to wash sludge to a lesser degree, approximately $250K can be saved for each wash not performed ($5M over 10 planned sludge batches). A reduced demand would also be placed on evaporators (at approximately $1 per gallon for evaporation, there would be a savings of $2.5M).	
Most Significant Cost Impact ($k): (7,500)		**Most Significant Schedule Impact :** 0	
Level:	**Moderate**	**Event Trigger:** N/A	
Handling Strategy:	Enhance	**Description:** After alternate reductant deployment, review each sludge batch preparation plan to identify the potential of reducing washing activity to allow this opportunity to be realized.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** This cost is included in the baseline.	
HS Implementation Schedule:	0	**Basis:** No impact to schedule.	
Other Handling Strategies: None			

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Opportunity Assessment Form

ID Number: 423 **Revision:** 03 **Last Date Evaluated:** 1/20/2016 **Status:** Active

Statement of Residual Risk: Implementing the use of Alternate Reductant in the DWPF process may allow processing of a higher Na molarity sludge.

Residual Likelihood:	Likely	**Basis:** Although the processing through the DWPF within the safety envelope is possible given the deployment of the alternate reductant, glass quality and frit formulations may not be available for higher molarity feeds.
Residual Consequence:	Marginal	**Basis:** By being able to wash sludge to a lesser degree, approximately $250K can be saved for each wash not performed ($5M over 10 planned sludge batches). A reduced demand would also be placed on evaporators (At approximately $1 per gallon for evaporation, there would be a savings of $2.5M).
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	N/A
	0	0	0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	All Cases: A savings of $7.5M may be realized
	(7,500)	(7,500)	(7,500)	
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	benefitt based on out-year impact only.
	(7,500)	(7,500)	(7,500)	
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments: Note: With an increase in Na molarity there is a potential for higher oxalate concentrations to DWPF (see risk 117).

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Opportunity Assessment Form

ID Number: 428 **Revision:** 03 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Event Title: Remove/Relieve Design Constraints on SDUs Based Upon Maturing Performance Assessment			
Type: Opportunity, Internal, Technical	**Category:** Regulatory and Environmental	**Group:** 3 - Out Year Risk and Consequences, with Near Term Risk Handling Strategy	
Assessable Element : 5.1	**Assessable Element Title:** Grout Encapsulation of Waste		
WBS Number: 01.90.03.01	**WBS Title:** Saltstone Operations		
Responsible Org: SRR-WD	**Contact:** Steve Thomas	**Date Identified:** 5/22/2013	

Statement of Event: The Performance Assessment (PA) forms a major part of the basis for 3116WD for Salt Waste Disposal. Conservative assumptions are made in the PA which can impose conservative SDU design constraints to ensure the assumptions remain valid. An opportunity exists that as data from field monitoring, sampling and testing becomes available, this data could be utilized with improved analysis techniques to lessen the conservatism within PA assumptions. This could result in relaxation or removal of some SDU design constraints providing cost savings and possibly reduced construction duration.

Likelihood:	Likely	**Basis:** Since the approval of the Salt Waste Disposal 3116WD, testing has continued and field monitoring and sampling have collected significant amounts of data. Computational techniques have been optimized on other PA calculations and where appropriate, assumptions have been made less conservative on those submittals. It is likely that revisiting the PA assumptions with this data and improved analysis techniques, that some constraints may be relaxed.
Consequence / Benefit:	Exceptional	**Basis:** The best case would be that the relaxation of PA assumptions results in the removal of specific physical design features from SDUs and cost savings of up to $20M on each SDU unit (e.g. changing wall construction to shotcrete, removing drainwater system etc., from design). Assuming this would occur after SDU6, there would be a cost savings of up to $20M x 6 SDUs.
Most Significant Cost Impact ($k): (120,000)		**Most Significant Schedule Impact :** 0
Level:	**High**	**Event Trigger:** N/A
Handling Strategy:	Enhance	**Description:** Performed reviews to identify areas of conservatism in the PA which are candidates for relaxation based on field data and /or the application of optimized analysis techniques. Further perform a Special Analysis (SA) targeting the areas identified for highest potential benefit. Obtain DOE approval of SA. Use the results of SA to modify the design constraints for future SDUs.

Handling Strategy Action Items:

428.1 Perform a review of the 3116WD PA and identify areas of conservatism where reduction has potential for design constraint relaxation., Steve Thomas, Completed, 1/19/2016

428.2 Perform a Special Analysis (SA) targeting the areas identified for highest potential benefit., Steve Thomas

428.3 Obtain DOE approval of SA., Steve Thomas

428.4 Use the results of SA to modify the design constraints for future SDUs., Jim Rugg

HS Implementation Cost ($K):	0	**Basis:** These activities are currently planned, but not included in the baseline.
HS Implementation Schedule:	0	**Basis:** No impact to the baseline schedule

Other Handling Strategies: None

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Opportunity Assessment Form

ID Number: 428 **Revision:** 03 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Statement of Residual Risk: An Opportunity remains that as PA Maintenance Plan outputs become available, this data could be utilized to lessen the conservatism within PA assumptions and save costs on future SDUs.

Residual Likelihood:	Likely	**Basis:** Likelihood has not increased due to execution of risk handling strategies and remains likely.
Residual Consequence:	Exceptional	**Basis:** The best case would be that the relaxation of PA assumptions results in the removal of specific physical design features from SDUs and cost savings of up to $20M on each SDU unit (e.g. changing wall construction to shotcrete, removing drainwater system etc., from design). Assuming this would occur after SDU6, there would be a cost savings of up to $20M x 6 SDUs.
Residual Risk Level:	**High**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (120,000)	**Most Likely** (120,000)	**Worst Case** (120,000)	For all cases: Removal of major physical design features from SDUs at a cost savings of $20M per SDU = $120M.
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (120,000)	**Most Likely** (120,000)	**Worst Case** (120,000)	Residual impact based on risk having out-year consequences only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments:

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Opportunity Assessment Form

ID Number: 438 **Revision:** 02 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Event Title: Salt Dissolution Creates Less than Expected Volume			
Type: Opportunity, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences	
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-PLAN	**Contact:** Pete Hill	**Date Identified:** 2/27/2014	
Statement of Event: Currently it is predicted that salt dissolution will produce approximately 110 million gallons of salt waste for processing. An opportunity exists that salt dissolution creates a less than anticipated volume of salt solution.			
Likelihood:	Very Unlikely	**Basis:** Based on salt dissolutions observed to date, there may be a reduction in the predicted volume, however it is considered very unlikely.	
Consequence / Benefit:	Exceptional	**Basis:** A lower volume of salt solution would result in accelerating the program when coupled with sludge processing. This could accelerate the Program end date by up to 1 year.	
Most Significant Cost Impact ($k): (650,000)		**Most Significant Schedule Impact :** (1 Yr)	
Level:	**Moderate**	**Event Trigger:** N/A	
Handling Strategy:	Accept	**Description:** N/A	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	N/A	**Basis:** N/A	
HS Implementation Schedule:	N/A	**Basis:** N/A	
Other Handling Strategies: None			

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Opportunity Assessment Form

ID Number: 438 **Revision:** 02 **Last Date Evaluated:** 1/26/2016 **Status:** Active

Statement of Residual Risk: Salt dissolution creates a less than anticipated volume of salt solution.

Residual Likelihood:	Very Unlikely	**Basis:** Based on salt dissolutions observed to date, there may be a reduction in the predicted volume, however it is considered very unlikely.
Residual Consequence:	Exceptional	**Basis:** A lower volume of salt solution would result in bringing the end of salt processing closer to the end of sludge processing and reducing the number of sludge modifier canisters being produced. This in turn would result in the acceleration of the overall program. This could accelerate the Program end date by up to 1 year.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	N/A
	0	0	0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Worst Case: Would only reduce Program overall duration by 3 months.
	(650,000)	(325,000)	(163,000)	Most Likely Case: Would reduce Program overall duration by 6 months.
Residual Schedule Impact :	(1 Year)	(6 Mths)	(3 Mths)	Best Case: Would reduce Program overall duration by 1 year.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Residual impact based on risk having out-year consequences only.
	(650,000)	(325,000)	(163,000)	
Residual Schedule Impact :	(1 Year)	(6 Mths)	(3 Mths)	

Risk Assumptions :

Event Comments:

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Opportunity Assessment Form

ID Number: 453 **Revision:** 02 **Last Date Evaluated:** 2/9/2016 **Status:** Active

Event Title: Perform Interim Salt Processing Without an MST Strike		
Type: Opportunity, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 2 - Near Term Risk and Risk Handling Strategy with Out Year Consequences
Assessable Element : 4.1.1	**Assessable Element Title:** ARP/MCU Salt Processing	
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition	
Responsible Org: SRR-ENG	**Contact:** Mark Keefer	**Date Identified:** 11/12/2014

Statement of Event: Currently, interim salt processing involves an MST strike at 241-96H and subsequent filtration at 512-S before salt feed is processed through MCU and the DSS sent to Tank 50 for saltstone production and disposal at SPF/SDF. Filtration is emerging as a processing problem which threatens to constrain increased throughput at MCU. Tank space is emerging as an issue which threatens salt feed preparation and operational flexibility of the HLW System in general. The 3116 WD allows interim processing of salt without an MST strike providing this can relieve tank space and processing issues and the DSS, when placed within an SDU can meet the requirements of Class C waste. An opportunity exists to perform interim salt processing without an MST strike (and potentially without filtration) which will aid in the resolution of both the technical issue of filtration and the issue of tank space and increase the throughput of MCU to process salt earlier.

Likelihood:	Very Likely	**Basis:** Based on a preliminary review of the regulatory requirements this is an acceptable path forward. Based on the analysis results of salt batches, Class C waste requirements can be met.
Consequence / Benefit:	Exceptional	**Basis:** MCU throughput could be increased from 1.5Mgals/yr to 3Mgals/yr for up to 2 years prior to SWPF startup. This processes an additional 3Mgals of salt feed. At a maximum SWPF production of 9M gals, this would save the Program 4 months. Additional savings from not operating 241-96H and cost savings of not requiring MST could be an additional $2M.
Most Significant Cost Impact ($k): (219,000)		**Most Significant Schedule Impact :** (4 Mths)
Level:	**High**	**Event Trigger:** Currently open: Close upon cessation of interim salt processing.
Handling Strategy:	Enhance	**Description:** A pilot no MST processing campaign is currently underway. Based on the results of this campaign, ensure regulators understand the benefit from proceeding with this processing strategy and gain concurrence from DOE to process without MST strikes for the remainer of MCU operation. Once concurrence is received, reconfigure interim salt processing to bypass actinide strike. Further investigate the feasibility of further performing interim salt processing without filtration.

Handling Strategy Action Items:

453.6 Re-configure facility(s) to allow bypass of 512-S facility and feed filtration., Joel Cantrell

453.2 Gain DOE acceptance to proceed in processing without an MST strike., Joel Cantrell

453.3 Re-configure facility(s) to allow bypass of 241-96-H and MST strike., Mike Borders

453.4 Investigate and if feasible develop business case for interim salt processing without filtration., Ryan McNew

453.5 Gain DOE acceptance to proceed in processing without filtration., Joel Cantrell

HS Implementation Cost ($K):	0	**Basis:** There is no additional cost for not using an MST strike.
HS Implementation Schedule:	0	**Basis:** There is no schedule impact.

Other Handling Strategies: None

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Opportunity Assessment Form

ID Number: 453 **Revision:** 02 **Last Date Evaluated:** 2/9/2016 **Status:** Active

Statement of Residual Risk: An opportunity exists to perform interim salt processing without an MST strike/feed filtration which will aid in the resolution of both the technical issue of filtration and the issue of tank space and increase the throughput of MCU to process salt earlier.

Residual Likelihood:	Very Likely	**Basis:** Based on a preliminary review of the regulatory requirements this is an acceptable path forward. Based on the analysis results of salt batches, Class C waste requirements can be met.
Residual Consequence:	Exceptional	**Basis:** MCU throughput could be increased from 1.5Mgals/yr to 3Mgals/yr for up to 2 years prior to SWPF startup. This processes an additional 3Mgals of salt feed. At a maximum SWPF production of 9M gals, this would save the Program 4 months. Additional savings from not operating 241-96H and cost savings of not requiring MST could be an additional $2M.
Residual Risk Level:	**High**	

NEAR TERM Residual Impact			
Residual Cost Impact ($K):	**Best Case** (2,000)	**Most Likely** (2,000)	**Worst Case** (2,000)
Residual Schedule Impact :	0	0	0

Basis of NEAR TERM Cost and Schedule Impacts:

All Cases: $2M savings from not operating 241-96H and cost savings of not requiring MST.

OUT YEAR Residual Impact			
Residual Cost Impact ($K):	**Best Case** (217,000)	**Most Likely** (217,000)	**Worst Case** (217,000)
Residual Schedule Impact :	(4 Mths)	(4 Mths)	(4 Mths)

Basis of OUT YEAR Cost and Schedule Impacts:

All Cases: MCU throughput could be increased from 1.5Mgals/yr to 3Mgals/yr for up to 2 years prior to SWPF startup. This processes an additional 9Mgals of salt feed. At a maximum SWPF production of 9M gals, this would save the Program 4 Mths. Additional savings from not operating 241-96H and cost savings of not requiring MST could be an additional $2M.

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)			
Residual Cost Impact ($K):	**Best Case** (219,000)	**Most Likely** (219,000)	**Worst Case** (219,000)
Residual Schedule Impact :	(4 Mths)	(4 Mths)	(4 Mths)

Basis of LIFE CYCLE Cost and Schedule Impacts:

Benefit includes near term and outyear benefits.

Risk Assumptions :

Event Comments:

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Opportunity Assessment Form

ID Number: 456 **Revision:** 01 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Event Title: Spread Cement Bags Evenly in Vault 4			
Type: Opportunity, Internal, Technical	**Category:** Regulatory and Environmental	**Group:** 1 - Near Term Risk, Risk Handling Strategy, and Consequences	
Assessable Element : 5.1	**Assessable Element Title:** Grout Encapsulation of Waste		
WBS Number: 01.90.03.01	**WBS Title:** Saltstone Operations		
Responsible Org: SRR-ENG	**Contact:** Eric Freed	**Date Identified:** 3/11/2015	
Statement of Event: Vault 4 contains cement bags previously placed there after a SPF upset condition. The bags are planned to be removed and dispositioned other than Vault 4 to conform to PA model. An opportunity exists that the bags could be spread evenly and remain in Vault 4 without negatively impacting the PA.			
Likelihood:	Likely	**Basis:** Based upon preliminary discussions with C&DA this appears promising.	
Consequence / Benefit:	Marginal	**Basis:** This will avoid the cement bags having to be removed, repackaged and disposed of onsite. Removal of the bags could cost up to $2M for construction, with an additional $500K in Radcon and IH costs. The disposal of the 52 B-12 cntainers would be up to $100K. Additional savings to PBS-SR-0030 could be realized if the on site disposal of these bags is not required.	
Most Significant Cost Impact ($k): (2,600)		**Most Significant Schedule Impact :** 0	
Level:	**Moderate**	**Event Trigger:** Currently open; Close upon completion of Vault 4 interim closure.	
Handling Strategy:	Exploit	**Description:** Develop a technical, regulatory and business case to allow the cement bags to remain within Vault 4.	
Handling Strategy Action Items: 420.1 Develop a regulatory position for technical options and select the most favorable methodology of being able to allow the cement bags to remain in Vault 4 (e.g. remote manipulation to reconfigure bags, accepting as-is configuration etc.)., Malcom Smith, Completed, 1/19/2016			
HS Implementation Cost ($K):	0	**Basis:** No additional cost to Program.	
HS Implementation Schedule:	0	**Basis:** No impact to schedule.	
Other Handling Strategies: None			

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Opportunity Assessment Form

ID Number: 456 **Revision:** 01 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Statement of Residual Risk: An opportunity exists that the bags could be spread evenly and remain in Vault 4 without negatively impacting the PA.

Residual Likelihood:	Likely	**Basis:** After developing a case for allowing cement bags to remain in Vault 4 a savings can be achieved.
Residual Consequence:	Marginal	**Basis:** This will avoid the cement bags having to be removed, repackaged and disposed of onsite. Removal of the bags could cost up to $2M for construction, with an additional $500K in Radcon and IH costs. The disposal of the 52 B-12 cntainers would be up to $100K. Additional savings to PBS-SR-0030 could be realized if the on site disposal of these bags is not required.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (2,600)	**Most Likely** (2,600)	**Worst Case** (2,600)	All Cases: Savings of $2.6M by avoiding the need to dispose of the cement bags on site.
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	N/A
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (2,600)	**Most Likely** (2,600)	**Worst Case** (2,600)	benefit based on near term savings only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments: Cross-cutting opportunity with PBS-SR-0030 for saving costs of disposal of 52 B-12 containers on site.

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Opportunity Assessment Form

ID Number: 473 **Revision:** 01 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Event Title: Remove Interior Coating Requirement from SDU Design			
Type: Opportunity, Internal, Technical	**Category:** Design	**Group:** -	
Assessable Element : 5.1	**Assessable Element Title:** Grout Encapsulation of Waste		
WBS Number: 01.90.03.01	**WBS Title:** Saltstone Operations		
Responsible Org: SRR-ENG	**Contact:** Noel Chapman	**Date Identified:** 4/28/2015	

Statement of Event: Saltstone Disposal Units (SDUs) are designed receive and house the final grout waste form from SPF. SDU 6 is currently under construction and a further seven similar SDUs are needed for the remainder of the Program. SDU 6 has an interior protective coating applied after the leak test is performed. The primary function of this coating is to protect the structural concrete walls of the SDU from degradation by attack from sulphates within the grout waste form placed inside the SDU. An opportunity exists to develop a position (utilizing testing and modeling) that the attack is insignificant and a coating is not required for SDUs.

Likelihood:	Likely	**Basis:** It is considered likely that a position (utilizing testing and modeling) can be developed that the attack is insignificant and a coating is not required for SDUs.
Consequence / Benefit:	Significant	**Basis:** Based on the project execution schedule it is not feasible to remove the requirement for an interior protective coating on SDU 6 however, this requirement could be removed from future SDUs with a saving of up to $5M on each SDU. This would be a saving of $35M to the Program.
Most Significant Cost Impact ($k): (35,000)		**Most Significant Schedule Impact :** 0
Level:	**Moderate**	**Event Trigger:** Currently open; Close upon DOE decision upon evaluating test results and SRR recommendations.
Handling Strategy:	Exploit	**Description:** Perform R&D to determine the actual effect of sulphate attack to SDU structure. The goal of this investigation is to develop a position (utilizing modeling) that the attack is insignificant and a coating is not required. As an alternate strategy, perform preliminary investigations into the feasibility of developing a grout recipe and controls to limit sulphate levels to below which a protective coating is no longer required. To fully exploit this opportunity, the requirements to build and successfully test a leak free tank without the use of an interior coating or liner systems must be determined (First of a kind SDU 6 did not achieve this condition).

Handling Strategy Action Items:

473.1 Perform testing under the Cementitious Barrier Partnership Program to determine the actual effect of sulphate attack to SDU structure., Kent Fortenberry

473.2 Develop a position (utilizing modeling based on testing data) that the attack is insignificant and a coating is not required for all SDU applications., To Be Assigned

473.3 Determine causes of cracking in SDU 6 and develop lessons learned or modified design criteria for future SDUs to prevent this condition., Kent Fortenberry

HS Implementation Cost ($K):	0	**Basis:** The cost of feasibility studies and developing a business case are included within the Program baseline (funded under technology development funding)
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies: None

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Opportunity Assessment Form

ID Number: 473 **Revision:** 01 **Last Date Evaluated:** 1/19/2016 **Status:** Active

Statement of Residual Risk: An opportunity exists to develop a position (utilizing testing and modeling) that the attack is insignificant and a coating is not required for SDUs.

Residual Likelihood:	Likely	**Basis:** It is considered likely that a position (utilizing testing and modeling) can be developed that the attack is insignificant and a coating is not required for SDUs.
Residual Consequence:	Significant	**Basis:** Based on the project execution schedule it is not feasible to remove the requirement for an interior protective coating on SDU 6 however, this requirement could be removed from future SDUs with a saving of up to $5M on each SDU. This would be a saving of $35M to the Program.
Residual Risk Level:	**Moderate**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (35,000)	**Most Likely** (35,000)	**Worst Case** (35,000)	All Cases: Savings of $5M on each of seven future SDUs ($35M)
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (35,000)	**Most Likely** (35,000)	**Worst Case** (35,000)	Benefit based on outyear savings only.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments:

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Opportunity Assessment Form

ID Number: 482 **Revision:** 00 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Event Title: Deploy TCCR on Multiple Tanks to Accelerate Tank Closure			
Type: Opportunity, Internal, Technical	**Category:** Process Performance - Flowsheet Issues/ Impacts	**Group:** 3 - Out Year Risk and Consequences, with Near Term Risk Handling Strategy	
Assessable Element : 4.1	**Assessable Element Title:** Salt Processing		
WBS Number: 01.90	**WBS Title:** Radioactive Liquid Waste Stabilization and Disposition		
Responsible Org: SRR-ENG	**Contact:** Mark Keefer	**Date Identified:** 1/28/2016	
Statement of Event: TCCR will be deployed for an operational campaign on Tank 10 for 8 months. An opportunity exists that by deploying TCCR on multiple tanks, closure of tanks can be accelerated.			
Likelihood:	Likely	**Basis:** Deployment on up to five additional tanks has been evaluated as accelerating closure.	
Consequence / Benefit:	Exceptional	**Basis:** Deployment of TCCR on five additional tanks can result in up to a two year acceleration in the tank closure campaign and a potential for earlier system plan completion. While the cost savings may be limited to under $200M, the ability to meet FFA milestones is a significant gain to DOE.	
Most Significant Cost Impact ($k): (200,000)	**Most Significant Schedule Impact :** 0		
Level:	**High**	**Event Trigger:** open upon first deployment of TCCR; Close upon completion of Program.	
Handling Strategy:	Exploit	**Description:** Develop a business case and deploy/redeploy TCCR on additional tanks.	
Handling Strategy Action Items: 481.1 Develop a business case, (including identification of necessary regulatory changes needed) to demonstrate the benefit of deploying/redeploying TCCR on additional tanks., Mark Keefer 481.2 Deploy/redeploy TCCR on additional tanks., Mark Keefer			
HS Implementation Cost ($K):	0	**Basis:** If the business case shows significant benefit (particularly in FFA milestones) it is assumed this will be implemented in the baseline.	
HS Implementation Schedule:	0	**Basis:** No schedule impact.	
Other Handling Strategies: None			

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Opportunity Assessment Form

ID Number: 482 **Revision:** 00 **Last Date Evaluated:** 1/28/2016 **Status:** Active

Statement of Residual Risk: An opportunity exists that by deploying TCCR on multiple tanks, closure of tanks can be accelerated.

Residual Likelihood:	Likely	**Basis:** Deployment on up to five additional tanks has been evaluated as accelerating closure.
Residual Consequence:	Exceptional	**Basis:** Deployment of TCCR on five additional tanks can result in up to a two year acceleration in the tank closure campaign and a potential for earlier system plan completion. While the cost savings may be limited to under $200M, the ability to meet FFA milestones is a significant gain to DOE.
Residual Risk Level:	**High**	

NEAR TERM Residual Impact				**Basis of NEAR TERM Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact :	0	0	0	

OUT YEAR Residual Impact				**Basis of OUT YEAR Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (200,000)	**Most Likely** (200,000)	**Worst Case** (200,000)	All Cases: $200M savings.
Residual Schedule Impact :	0	0	0	

LIFE CYCLE Residual Impacts (total of Near Term and Out Year)				**Basis of LIFE CYCLE Cost and Schedule Impacts:**
Residual Cost Impact ($K):	**Best Case** (200,000)	**Most Likely** (200,000)	**Worst Case** (200,000)	Benefits based on outyear savings.
Residual Schedule Impact :	0	0	0	

Risk Assumptions :

Event Comments:

APPENDIX F – Action Item Listing (Example)

427.4	Guy Campbell	Deploy unit operation to avoid sending DWPF recycle to Tank Farm.	4/1/2018	Currently not Funded

EventID *428* ***EventTitle*** *Remove/Relieve Design Constraints on SDUs Based Upon Maturing Performance Analysis*

EventTrigger *N/A* ***OpenTrig:*** ***ClosedTrig:***

AI No	*AI Responsibility*	*Action Item Description*	*DueDate*	*ActualDate*	*Closure Basis Doc.*
428.1	Steve Thomas	Perform a review of the 3116WD PA and identify areas of conservatism where reduction has potential for design constraint relaxation (Value Study).	9/30/2016		2014-CTS-13008. Funding not available for FY 15, this action will be considered for FY 16 if funding is provided. Due date pushed out 1 year.
428.2	Steve Thomas	Perform a Special Analysis (SA) targeting the areas identified for highest potential benefit.	7/31/2017		2014-CTS-13008. Funding not available for FY 15, this action will be considered for FY 16 if funding is provided. Due date pushed out 1 year.
428.3	Steve Thomas	Obtain DOE approval of SA.	10/30/2017		2014-CTS-13008. Funding not available for FY 15, this action will be considered for FY 16 if funding is provided. Due date pushed out 1 year.
428.4	Jim Rugg	Use the results of SA to modify the design constraints for future SDUs.			Need to schedule based on results of 428.1 - 3 for implementation with SDU 7.

EventID *430* ***EventTitle*** *No Disposal Path Exists for Spent Solvent from ARP/MCU*

EventTrigger *Currently open; Close upon disposition of spent solvent after MCU shutdown.* ***OpenTrig:*** ***ClosedTrig:***

AI No	*AI Responsibility*	*Action Item Description*	*DueDate*	*ActualDate*	*Closure Basis Doc.*
430.1	Keith Harp	Identify alternate disposal paths, e.g. vendors upfront to allow effective disposal. Develop effective strategy for remediation and/or disposal of waste to avoid any RCRA violations.	6/30/2018		2014-CTS-013138

APPENDIX G – Riskometer (Example)

PBS-SR-0014 Riskometer

(Sort By: Final Risk Level/ID)

ID	Title	Initial Risk Level	Review Date	Final Risk Level	Status: Closed	Status: Acceptable Risk	Status: Minor Concern	Status: Major Concern	Remarks
011	Tank Farm Infrastructure/Equipment Failure (Not Including Transfer Lines or 3H Evaporator)	High	1/22/2015	High			Yellow		Continue expanded System Health Reporting. Managing degraded systems through the use of temporary modifications. Implementing improvements in phases based on limited funding. FY15 activities include upgrade of some waste tank ventilation systems, installation of air compressors at HDB-8 and 241-58H, initiating procurement of pump tank transfer pumps, installation of the pipe bridge to support future services upgrades on the East Hill and design for future services upgrades for Tanks 48-51.
012	DWPF Equipment Failure (Excluding Melter)	High	1/21/2015	Moderate				Red	To develop an all-encompassing spare parts program would require additional funding. No available on hand spares for MFT, SME or SRAT. Potential re-use of SME vessel yet to be determined. Major concern will be reduced to a Minor concern when spare SRAT, SME, MFT and supporting auxiliary equipment (transfer pumps, agitators) have been obtained.
018	Saltstone Processing Facility (SPF) Cannot Achieve Attainment	Moderate	1/9/2015	Low			Yellow		Continuing to update critical spares list. Additional items are being added based on operating experience. Performing investigation, evaluation, recommendation and deployment of improvements to achieve enhanced capacity and reliability (ELAWD).
021	Replacement DWPF Melter Failure	Moderate	1/9/2015	Moderate				Red	Development of significant and complex remote repair techniques, is not funded. Melter 4 vessel and frame fabrication has been completed. The refractory installation has been completed and refractory dryout is complete. Melter 4 onsite, final assembly is currently not funded. Major concern becomes Minor concern when 2 spare melters are assembled and ready to be installed in the DWPF melt cell.
022	Spare Melter Material/Vendor Unavailable	High	1/9/2015	Zero			Yellow		Melter 4 is currently in Building 717-F but final onsite assembly is currently unfunded. DWPF Engineering has recently received information that the Monofrax K-3 vendor may cease further operations at the K-3 facility. This could affect the availability of K-3 refractory brick for Melter 5 and future melters. Procurement of K-3 refractory has been placed with the vendor.
027	Program (PBS-SR-0014) Funding Impacted by Competing Priorities (DOE Risk)	High	1/12/2015	High				Red	This risk has been determined to be a cross-cutting, DOE-HQ owned risk and is included in the DOE-SR Federal Risk Management Plan. Cost reducing alternative to GWSB has been selected and change in design to the Saltstone Disposal Units is under implementation. Major concern can be reduced to minor concern when near-term funding targets can support near-term execution goals.
030	3H Evaporator Material and Chemical Balance Issues	Moderate	1/11/2015	Moderate		Green			Maintaining evaporator feed qualification program.

Content changed from last update

Blue: *Risk has been closed* Green: *Not a problem, no issues at this time* Yellow: *Minor concern* Red: *Major concern*

APPENDIX H – T&PRA Contingency Analysis

Risk Contribution to NTB T&PRA Contingency

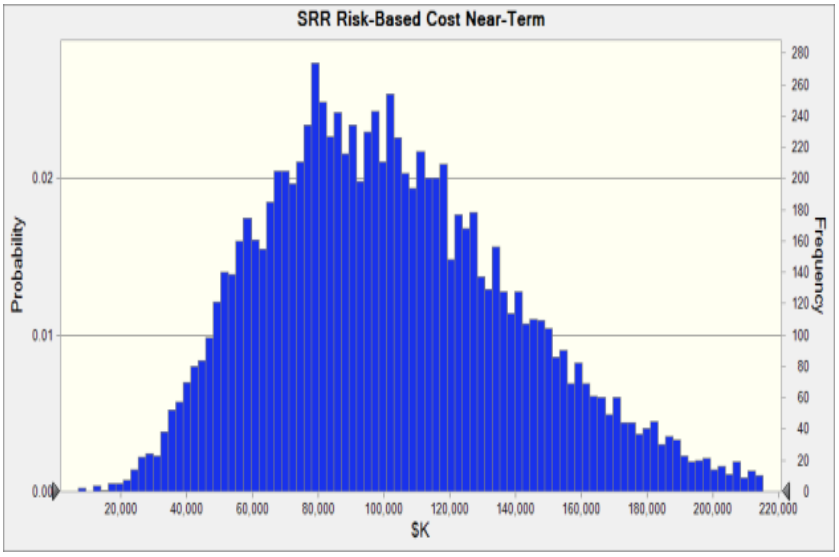
ID	Risk Title	Likelihood	BC ($K)	MLC ($K)	WC ($K)
011	Tank Farm Infrastructure/Equipment Failure (Not Including Transfer Lines or 3H Evaporator)	Very Likely	1,000	2,000	5,000
012	DWPF Equipment Failure (Excluding Melter)	Very Likely	500	1,500	10,000
018	Saltstone Processing Facility (SPF) Cannot Achieve Attainment	Unlikely	0	2,500	2,500
037	DWPF Impacted by Chemistry / Quantity of Salt Waste Feed	Unlikely	5,000	10,000	20,000
100	Waste Tank Utilization Conflict	Likely	1,000	1,000	1,000
102	2H Evaporator Impacted by DWPF Recycle Enrichment	Unlikely	1,500	2,250	3,750
174	Tank Cleaning Not Sufficient for Tank Closure (DOE Risk)	Very Unlikely	10,000	10,000	20,000
175	Canyon Waste Contains Rogue Constituents (DOE Risk)	Very Unlikely	0	10,000	50,000
182	Radioactive Release From Tank Farm	Unlikely	1,000	2,000	5,000
197	DWPF Transfer Line Failure	Very Unlikely	1,000	5,000	25,000
204	Interarea Transfer Line Failure	Very Likely	2,000	10,000	20,000
209	Impacts of NRC Monitoring of 3116 Implementation for Salt Processing (DOE Risk)	Very Unlikely	1,000	5,000	10,000
213	NRC Activities for Monitoring of Closure Process Not Well Defined (DOE Risk)	Very Unlikely	2,000	4,000	5,000
214	Compliance Assessment Data Conflicts With Assumptions Upon Which 3116 WD is Based	Unlikely	6,000	6,000	6,000
219	DWPF Criticality Concerns During SWPF Processing and/or Sludge Batch Processing	Very Unlikely	0	0	10,000
220	Inaccuracies When Sampling for Grout Formulation in Tank 50	Very Unlikely	0	2,500	2,500
286	DOE Requires DWPF AB Update to Latest STD (3009) Based on Number/Significance of Changes (DOE Risk)	Very Likely	4,000	4,000	4,000
289	DWPF Infrastructure Failure Forces DWPF Outage	Likely	500	500	500
295	Tank Farm Transfer Line Failure	Very Likely	500	5,000	20,000
299	Tank Leaks to Environment During Tank Cleaning Step	Very Unlikely	22,000	22,000	22,000
325	DWPF Dry Frit System Experiences Frequent Pluggage	Very Unlikely	4,000	4,000	4,000
343	Size Reduced Zeolite Cannot be Resuspended in Waste Tanks	Very Unlikely	10,000	10,000	10,000
417	Replacement Melter(s) Damaged During Storage/Assembly	Very Unlikely	5,000	12,000	45,000
418	DOE Requires USQE to be Performed on all Modifications (DOE Risk)	Very Likely	7,900	7,900	7,900
430	No Disposal Path Exists for Spent Solvent from ARP/MCU	Likely	10,000	10,000	20,000
440	Prior to Closure Contamination Migrates from Vault 4	Unlikely	5,000	10,000	20,000

ID	Risk Title	Likelihood	BC ($K)	MLC ($K)	WC ($K)
445	Scope to be Added to PBS-0014 Due to Dispersion Characteristics Change is not Defined (DOE Risk)	Very Likely	0	5,000	100,000
448	Salt Precipitated from DWPF Recycle Requires Criticality Sampling Prior to Dissolution	Likely	0	22,000	28,000
450	SWPF Accelerated Salt Dissolution Does not Permit NCSE Aerial Density Analyses Techniques	Unlikely	5,000	5,000	5,000
453	Perform Interim Salt Processing Without an MST Strike	Very Likely	(2,000)	(2,000)	(2,000)
456	Spread Cement Bags Evenly in Vault 4	Likely	(2,600)	(2,600)	(2,600)
459	Warehouse Fire Destroys Critical Equipment (Excluding Melters) (DOE Risk)	Very Unlikely	25,000	50,000	100,000
461	Additional Requirements Imposed on Tank Farm Operation Due to Hanford Vapor Issues	Unlikely	500	1,000	45,000
463	Increased Level of Mercury in Saltstone Grout	Unlikely	0	0	120,000
466	Increased Levels of Mercury in HLW System Creates Industrial Hazards	Very Unlikely	2,000	5,000	10,000
472	DOE Directs Additional Business/Project Requirements on Lower Level Activities (DOE Risk)	Very Likely	0	10,000	15,000

BC-Best Case; MLC-Most Likely Case; WC-Worst Case.

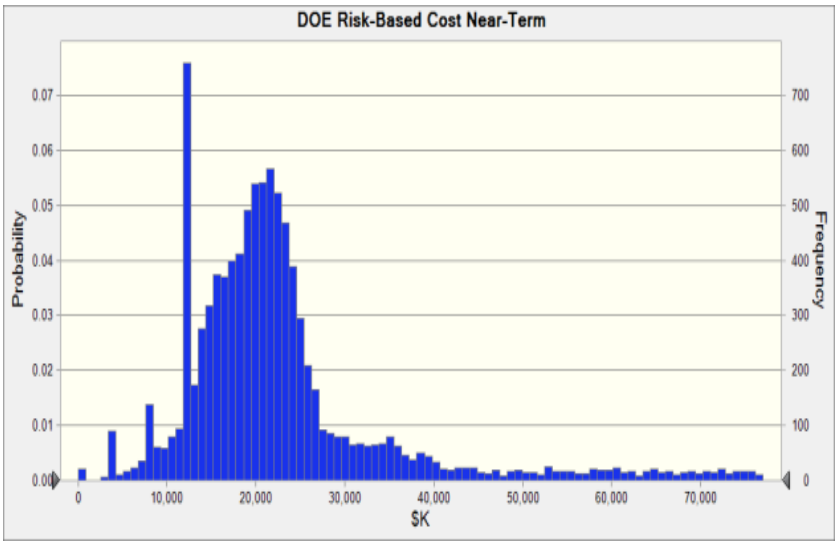
DOE Risk

Crystal Ball Results for SRR NTB



Percentiles:	Forecast values ($K)
0%	6,980
10%	55,428
20%	68,453
30%	79,138
40%	88,532
50%	98,712
60%	109,064
70%	120,712
80%	135,370
90%	156,817
100%	285,681

Crystal Ball Results for DOE NTB



Percentiles:	Forecast values ($K)
0%	0
10%	11,900
20%	14,820
30%	17,153
40%	19,126
50%	20,746
60%	22,231
70%	24,022
80%	28,122
90%	44,409
100%	143,154

OPER Risk Contribution to T&PRA Contingency

ID	Risk Title	Likelihood	BC ($K)	MLC ($K)	WC ($K)
011	Tank Farm Infrastructure/Equipment Failure (Not Including Transfer Lines or 3H Evaporator)	Very Likely	55,000	329,000	665,000
012	DWPF Equipment Failure (Excluding Melter)	Very Likely	0	54,000	163,000
018	Saltstone Processing Facility (SPF) Cannot Achieve Attainment	Unlikely	0	108,000	108,000
021	Replacement DWPF Melter Failure	Likely	0	163,000	433,000
030	3H Evaporator Material and Chemical Balance Issues	Unlikely	54,000	325,000	650,000
034	DWPF Impacted by Chemistry/Rheology of Sludge Waste Feed	Likely	166,000	331,000	441,000
036	Sampling and Analysis of Salt Feed to ARP/MCU Shows SPF WAC Cannot be Met After Processing	Very Unlikely	12,500	75,000	108,000
040	Salt Dissolution Results in Greater than Planned Precipitation of Gibbsite	Likely	600	1,200	1,800
041	Formation of Sodium Aluminosilicate in a Salt Tank	Unlikely	0	163,000	325,000
042	Salt Waste Heel or Tank Annuli Waste has to be Processed Through DWPF	Very Unlikely	81,000	163,000	325,000
045	Higher Curie Sludge Impacts DWPF Canister Production	Likely	250	163,000	325,000
048	Sludge Physical Properties Cause Delays in Meeting Sludge Feed Objectives	Very Unlikely	54,000	108,000	163,000
070	Rogue Constituents in Salt Feed	Unlikely	0	108,000	163,000
083	Non-routine Constituents in Sludge Impact Canister Production Rate	Likely	82,250	165,500	931,000
084	Lack of Dispositioning of Failed Equipment Impacts DWPF Operations	Likely	54,000	54,000	108,000
090	Tank Farm Tank Availability and Infrastructure Does Not Support Salt Processing Operations	Likely	650,000	650,000	1,300,000
091	Close Coupling-SWPF, DWPF, ARP/MCU and SPF Limits Waste Processing Throughput (Non-Chemistry)	Likely	75,000	150,000	300,000
094	Available Tank Farm Space Cannot Support System Plan	Likely	108,000	325,000	488,000
102	2H Evaporator Impacted by DWPF Recycle Enrichment	Unlikely	3,750	7,500	12,750
117	Oxalates from Acidic Tank Cleaning Cause Sludge/Salt Batch Preparation Problems	Unlikely	54,000	108,000	163,000
120	Sludge Batch Preparation Impacted by Slow Settling Rate	Unlikely	54,000	108,000	163,000
121	Salt Dissolution Creates Greater Than Expected Volume of Salt Solution	Very Unlikely	163,000	325,000	650,000
129	Slower Salt Dissolution Rates Force Schedule Delays	Very Unlikely	25,000	54,000	163,000
145	Limited DWPF Laboratory Capabilities Challenged by New Constituents	Likely	25,000	54,000	163,000
149	HLW Tank Leak Requires the Use of Contingency Space	Unlikely	325,000	650,000	1,300,000
168	SWPF Does Not Achieve System Plan Throughput / Attainment	Likely	325,000	650,000	975,000

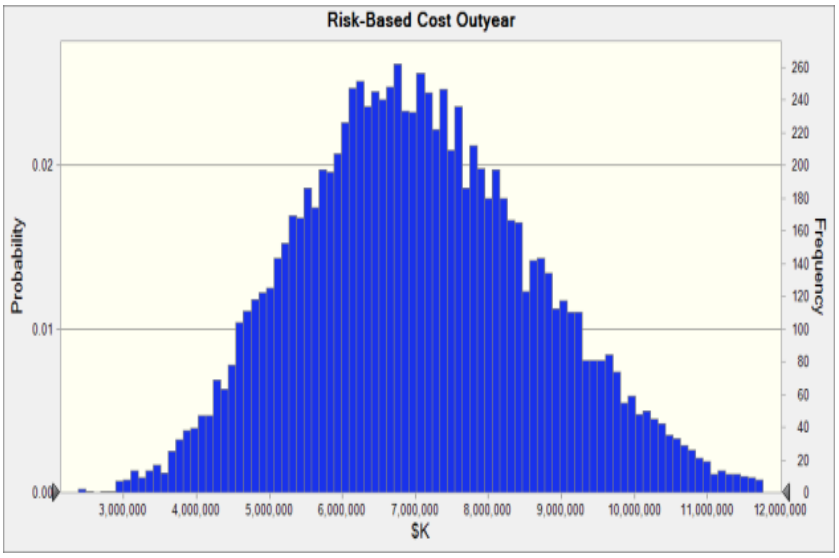
ID	Risk Title	Likelihood	BC ($K)	MLC ($K)	WC ($K)
173	Feedback from Technical Successes to DOE Complex (DOE Opportunity)	Very Likely	(59,000)	(28,000)	(14,500)
174	Tank Cleaning Not Sufficient for Tank Closure (DOE Risk)	Very Unlikely	50,000	50,000	50,000
175	Canyon Waste Contains Rogue Constituents (DOE Risk)	Very Unlikely	0	54,000	108,000
182	Radioactive Release From Tank Farm	Unlikely	54,000	108,000	163,000
197	DWPF Transfer Line Failure	Very Unlikely	54,000	163,000	650,000
204	Interarea Transfer Line Failure	Very Likely	163,000	325,000	650,000
205	SWPF Not Available When Planned (DOE Risk)	Likely	271,000	596,000	1,191,000
208	Improvements in Waste Removal	Very Likely	(25,000)	(15,000)	(10,000)
209	Impacts of NRC Monitoring of 3116 Implementation for Salt Processing (DOE Risk)	Very Unlikely	0	0	325,000
213	NRC Activities for Monitoring of Closure Process Not Well Defined (DOE Risk)	Very Unlikely	3,000	6,000	15,000
220	Inaccuracies When Sampling for Grout Formulation in Tank 50	Very Unlikely	0	108,000	108,000
221	Salt Baseline Characterization Different Than Forecast	Unlikely	0	108,000	217,000
224	Improvements in Closure	Very Likely	(25,000)	(15,000)	(10,000)
226	Influent Reductions	Likely	(163,000)	(108,000)	(54,000)
227	Waste Characterization Improvements	Very Likely	(10,000)	(5,000)	(2,500)
251	Aluminum Dissolution Impacts Saltstone Processing	Unlikely	163,000	325,000	650,000
257	Inter-Area Transfer Line "Salts Out"	Very Unlikely	0	50,000	50,000
264	DWPF is Unable to Process SWPF Strip Effluent at Required Throughput Due to Boil off Capacity Limits	Very Unlikely	325,000	650,000	975,000
267	Schedule For Complex Concurrent Activities Not Sustainable	Likely	163,000	325,000	650,000
286	DOE Requires DWPF AB Update to Latest STD (3009) Based on Number/Significance of Changes (DOE Risk)	Very Likely	217,000	217,000	217,000
289	DWPF Infrastructure Failure Forces DWPF Outage	Likely	0	0	12,500
290	Interface Requirements With EPC Contractor Do Not Support Integration of SWPF (DOE Risk)	Very Unlikely	12,500	25,000	54,000
291	Skilled Craft Labor is Not Available to Support Liquid Waste Needs	Unlikely	54,000	108,000	163,000
295	Tank Farm Transfer Line Failure	Very Likely	54,000	163,000	650,000
325	DWPF Dry Frit System Experiences Frequent Pluggage	Very Unlikely	108,000	108,000	108,000
344	3H Evaporator Pot Failure	Unlikely	345,000	345,000	345,000
346	Tank Closure Sampling Strategy is Not Effective	Very Unlikely	2,500	3,000	3,500
358	Solids Build up Within Blend and Feed Tanks	Unlikely	232,000	232,000	463,000

ID	Risk Title	Likelihood	BC ($K)	MLC ($K)	WC ($K)
363	SDF Isopar Limits Restrict ARP/MCU Salt Processing Through Tank 50	Likely	12,500	25,000	37,500
364	SDUs are Not Available When Required (Project Execution Delays)	Unlikely	54,000	108,000	163,000
384	Develop Approved Final Disposal Paths for DWPF Failed Equipment	Unlikely	(20,000)	(20,000)	(20,000)
389	Reduce Future Closure Requirements	Likely	(48,000)	(48,000)	(48,000)
390	SDUs Not Available When Required (Operating Permit Delays)	Unlikely	12,500	54,000	163,000
393	Operation of NGS at Higher Sodium Molarity	Likely	(285,000)	(80,000)	(40,000)
400	Single Source Supply Chains Fail to Deliver Materials/Equipment When Needed	Likely	121,000	241,000	480,000
402	Beyond Current Design Basis Requirements Imposed (DOE Risk)	Likely	10,000	20,000	100,000
403	Tank 48 Processing Takes Longer than Planned	Likely	5,000	10,000	20,000
405	Tank 48 Processing Creates a Waste Without an on Site Disposal Path	Very Unlikely	2,500	5,000	10,000
414	Higher Cs Waste in DWPF Prevents Equipment Contact Repair	Very Likely	8,000	8,000	8,000
415	Saltstone Disposal Facilities (SDF) Cannot Achieve Attainment	Unlikely	54,000	163,000	325,000
417	Replacement Melter(s) Damaged During Storage/Assembly	Very Unlikely	0	0	650,000
418	DOE Requires USQE to be Performed on all Modifications (DOE Risk)	Very Likely	19,000	19,000	19,000
422	Organic Carryover in ISDP Waste to DWPF	Very Unlikely	12,500	12,500	12,500
423	Higher Molarity Sludge Processing	Likely	(7,500)	(7,500)	(7,500)
424	Salt Processing Limited by Actinide Removal Capacity	Very Unlikely	12,500	37,500	75,000
426	Acidic Chemical Cleaning is Required on Non-Sludge Solids Tanks	Unlikely	5,000	15,000	30,000
427	DWPF Recycle Contains High Proportion of Solids	Unlikely	325,000	650,000	1,300,000
428	Remove/Relieve Design Constraints on SDUs Based Upon Maturing Performance Assessment	Likely	(120,000)	(120,000)	(120,000)
435	High Mercury in Sludge Impacts Processing at DWPF	Unlikely	812,500	812,500	1,625,000
436	Excessive Sludge Carryover During Boil Up	Unlikely	0	1,950,000	3,250,000
438	Salt Dissolution Creates Less than Expected Volume	Very Unlikely	(650,000)	(325,000)	(163,000)
445	Scope to be Added to PBS-0014 Due to Dispersion Characteristics Change is not Defined (DOE Risk)	Very Likely	0	20,000	258,000
446	Saltstone WAC for I-129 Impacts Salt Processing	Very Unlikely	650,000	1,950,000	3,250,000
450	SWPF Accelerated Salt Dissolution Does not Permit NCSE Aerial Density Analyses Techniques	Unlikely	20,000	20,000	20,000
452	As Found Field Configurations on Old Style Tanks do not Match Technical Baseline	Unlikely	1,600	4,000	8,000
453	Perform Interim Salt Processing Without an MST Strike	Very Likely	(217,000)	(217,000)	(217,000)

ID	Risk Title	Likelihood	BC ($K)	MLC ($K)	WC ($K)
455	TSR Limit Prevents Tank Entering Closure Mode After Cleaning has Been Completed	Likely	500	1,500	2,500
457	SCDHEC does not Allow Temporary Use of Old Style Tanks After BWRE	Very Unlikely	325,000	650,000	1,300,000
458	Targeted Sludge Tank Does not Contain Predicted Quantity of Sludge	Likely	163,000	325,000	650,000
459	Warehouse Fire Destroys Critical Equipment (Excluding Melters) (DOE Risk)	Very Unlikely	163,000	325,000	650,000
462	Increased Aluminum due to Aluminum Dissolution Creates Precipitation During Processing	Very Unlikely	163,000	325,000	650,000
463	Increased Level of Mercury in Saltstone Grout	Unlikely	325,000	650,000	1,300,000
466	Increased Levels of Mercury in HLW System Creates Industrial Hazards	Very Unlikely	2,000	5,000	10,000
467	Oxalates Impact Salt Processing	Likely	163,000	163,000	325,000
468	DWPF Sand Filter is Expended Before Design Life is Reached	Very Unlikely	20,000	20,000	20,000
469	Sampling Requirements at MCU Limit Planned Throughput	Likely	12,500	25,000	50,000
470	Processing Higher Curie Feed Increases MCU Outage Durations	Likely	12,500	25,000	37,500
471	Tank 50 Cannot be Transferred to Saltstone	Unlikely	75,000	75,000	108,000
472	DOE Directs Additional Business/Project Requirements on Lower Level Activities (DOE Risk)	Very Likely	300,000	410,000	765,000
473	Remove Interior Coating Requirement from SDU Design	Likely	(35,000)	(35,000)	(35,000)
476	DWPF Flammability Issue Resolution Constrains Throughput	Very Unlikely	163,000	163,000	325,000
477	Multiple Flowsheet Changes Result in Processing Issues	Unlikely	54,000	163,000	325,000
479	TCCR is Not Available When Planned	Likely	12,500	12,500	25,000
480	TCCR Does not Perform as Required	Likely	12,500	12,500	25,000
482	Deploy TCCR on Multiple Tanks to Accelerate Tank Closure	Likely	(200,000)	(200,000)	(200,000)
483	Coatings Applied to Interiors of SDUs 2, 3, 5 and 6 are Inadequate	Unlikely	0	54,000	54,000
484	After Aluminum Dissolution, Remaining Aluminum Impacts Processing	Very Unlikely	54,000	163,000	325,000

BC-Best Case; MLC-Most Likely Case; WC-Worst Case.

Crystal Ball Results for OPER



Percentiles:	Forecast values ($K)
0%	2,165,083
10%	4,976,659
20%	5,625,083
30%	6,123,007
40%	6,546,525
50%	6,967,934
60%	7,401,054
70%	7,878,767
80%	8,453,307
90%	9,287,545
100%	15,814,251