Y-RAR-H-00065

Revision 5

SAVANNAH RIVER REMEDIATION

LIQUID WASTE DISPOSITION PROJECTS

Project #G-002 Tank 48 Treatment Process (TTP)
Risk and Opportunity Analysis Report

Savannah River Site
Aiken, SC 29808

Prepared for the U.S. Department of Energy Under
Contract Number DE-AC09-09SR22505

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SUMMARY OF REVISIONS

Issue Date	Revision	Description
11/20/06	0	Initial Issue
10/14/08	1	General revision, incorporating updated risk data, no change bars used.
12/18/09	2	General revision, incorporating updated risk data, no change bars used.
1/28/2010	3	Corrected typographical error (unmitigated number of low risks is 4 and total of unmitigated risks is therefore 66) pages 6 and 12.
6/16/2010	4	General revision, incorporating updated risk data, no change bars used.
10/26/10	5	General revision, incorporating updated risk data, no change bars used.

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EXECUTIVE SUMMARY

Savannah River Remediation (SRR) LLC is tasked with the removal and disposition of waste currently stored within Liquid Waste Tanks at SRS. To accomplish this task the Liquid Waste System Plan (Reference 4) was developed which, during its implementation will require the definition and execution of discrete operational campaigns, projects and workscopes. A Program Risk and Opportunity Management Plan (ROMP) (Reference 1) was prepared to address the overall risks associated with the Liquid Waste System Plan implementation, and present the risk management process for the SRR Contract Performance Baseline (CPB).

Successful Liquid Waste System Plan execution requires the deployment of new facilities and processes (e.g. Salt Waste Processing Facility [SWPF], Saltstone Disposal Units [SDUs]), modifications of existing facilities and infrastructure (e.g. Defense Waste Processing Facility [DWPF], Saltstone), and system and equipment replacement and maintenance necessary to maintain the capability of waste storage, waste removal and waste processing.

Waste removal is closely followed by tank cleaning and closure activities, infrastructure closure and eventually facility and area closure in the final years of the Liquid Waste System Plan.

In addition to ongoing facility operations, projects will be initiated and implemented throughout the Liquid Waste System Plan life cycle to ensure successful execution.

This risk and opportunity analysis report (ROAR) addresses risks and opportunities associated with one of the Liquid Waste System Plan Baseline support projects, namely the Tank 48 Treatment Process (TTP) Project. This project has been categorized as a capital asset project subject to full DOE O413.3A compliance (References 7 and 8). This report describes how the six steps of the risk management process (i.e. planning, identification, grading, handling, impact determination and integration) will be applied to this project and satisfies the requirements of providing a Risk and Opportunity Management Plan for the Project while also presenting the associated levels of risk, the risk handling strategies (RHSs) to be employed, the residual risk, the process for deriving management reserve (MR) and contingency and presenting the results of this process.

The initial issuance of this report was used as a basis for development of a conceptual estimate in support of Critical Decision (CD)-1. It was subsequently revised since the commencement of work after CD-1. This revision documents the changes to date in the progression through Preliminary Design. The risk data developed since the last update were reviewed by the TTP Project Team and then a brainstorming approach was used to identify any additional risks or opportunities which were then validated and handling strategies developed.

A total of 67 risks were validated. These risks were categorized as contractor-owned or DOE-owned risks. These comprised of 32 high, 23 moderate, 3 low risks 5 operational vulnerabilities, 3 Program risks and one risk for overall funding of the project. Risk handling strategies were developed for all risks.

After application of the RHSs, 49 risks will be mitigated, 11 risks avoided and 7 risks accepted. The resulting handled risks that would remain open with the potential to impact the project, based on the worst case residual impact assessed by the Team were comprised of 12 high risk, 20 moderate risks, 12 low risks. Also remaining open, but with no contribution to T&PRA were 8 operational vulnerabilities, 3 Program risks and one risk for overall funding of the project, requiring a project re-baselining if realized.

All opportunities have been closed and no new opportunities identified.

The residual risk levels, estimate and schedule uncertainty were analyzed and used to derive a Management Reserve (MR) and DOE Contingency estimate as follows:

Component	**SRR MR**	**DOE Contingency**
Estimate	$6,859,523	$8,497,619
Schedule	$3,634,960	$1,590,663
T&PRA	$4,515,960	$12,651,500
Total	**$15,010,443**	**$22,739,782**

To achieve an 80% confidence level, the required schedule contingency was calculated to be 7 Months.

It must be noted that although the required 80% confidence level is attained by providing the TTP Project with fully funded T&PRA based contingencies, a risk remains (DOE-owned risk 016 "Implementation of DNFSB Recommendation 2004-2 Required"), that if realized in the worst case could result in the need for an active confinement ventilation system which would exceed the current risk-based T&PRA contingencies. Project management will focus on mitigating this risk as a priority early in the TTP Project life cycle to avoid the potential for re-baselining of the project should the worst case impact be realized.

ABBREVIATIONS and ACRONYMS

BCP –Baseline Change Proposal

CD – Critical Decision

CL – Confidence Level

CPB – Contract Performance Baseline

DOE – Department of Energy

DNSFB – Defense Nuclear Facilities Safety Board

DSA - Documented Safety Analysis

DWPF – Defense Waste Processing Facility

FBSR – Fluidized Bed Steam Reforming

GAC – Granular Activated Charcoal

HTF – H-Area Tank Farm

ITP – In-Tank Precipitation

IWT – Industrial Waste Treatment

LWO – Liquid Waste Operations

MR – Management Reserve

PDT – Product Dissolution Tank

PST – Product Storage Tank

ROAF – Risk and Opportunity Assessment Form

ROAR – Risk and Opportunity Analysis

ROMP – Risk and Opportunity Management Plan

RHS – Risk Handling Strategy

SCDHEC – South Carolina Department of Health and Environmental Control

SDIT – Safety in Design Integration Team

SDU – Saltstone Disposal Units

SRR – Savannah River Remediation

SRS – Savannah River Site

SRNL – Savannah River National Laboratories

SRNS – Savannah River Nuclear Solutions

SSF – Saltstone Facility

SWPF – Salt Waste Processing Facility

T&PRA – Technical and Programmatic Risk Assessment

TPB –Tetraphenylborate

TR&C – Task Requirements and Criteria

TTP – Tank 48 Treatment Process

WAC – Waste Acceptance Criteria

WFT – Waste Feed Tank

URS SMS – URS Safety Management Solutions

1.0 OVERVIEW

SRR is tasked with the removal and disposition of waste currently stored within Liquid Waste Tanks at SRS. To accomplish this task the Liquid Waste System Plan (Reference 1) was developed which, during its implementation will require the definition and execution of discrete operational campaigns, projects and workscopes.

Successful Liquid Waste System Plan execution requires the deployment of new facilities and processes (e.g. SWPF, SDUs), modification of existing facilities and infrastructure (e.g. DWPF, Saltstone), and system and equipment replacement and maintenance necessary to maintain the capability of waste storage, waste removal and waste processing.

Waste removal is closely followed by tank cleaning and closure activities, infrastructure closure and eventually facility and area closure in the final years of the Liquid Waste System Plan. In addition to ongoing facility operations, projects will be initiated and implemented throughout the Liquid Waste System plan life cycle to ensure successful execution.

The PBS-SR-0014 Risk and Opportunity Management Plan (ROMP) (Reference 1) presents the overall Liquid Waste System Plan execution risks and opportunities, summarizes the individual projects ROAR data. The process used to develop the PBS-SR-0014 ROMP and this project specific ROAR are defined within manual S14, Procedure 1.12 (Reference 9).

The following projects relate to the integration of Tank 48 back into the Liquid Waste System:

- Tank 48 Treatment Process (TTP Project)
- Tank 48 Return to Service
- Tank 48 Heel Disposition

This ROAR is applicable to the TTP Project.

1.1 Project Description

The TTP Project has been categorized as a Capital Asset Project subject to full DOE O413.3A compliance (References 7 and 8).

Tank 48H currently contains approximately 240,000 gallons of salt solution containing 21,800 kilograms of potassium and cesium tetraphenylborate (TPB) salts generated during the 1983 In-Tank Precipitation (ITP) Process demonstration and the subsequent operation of the ITP facility in 1995/1996. The organic nature of TPB salts makes the Tank 48H waste incompatible with the existing treatment and disposition facilities. In order to meet organic requirements in the current Documented Safety Analysis (DSA), which limit the amount of TPB that can remain in the tank when returned to service and due to the need for additional liquid waste storage, successful disposition of the material in Tank 48H is essential.

Evaluation of alternative methods for disposition of the TPB resulted in the selection of a Fluidized Bed Steam Reforming (FBSR) process. A detailed description of the scope of the TTP Project is contained within Reference 2. In summary the TTP Project will design, install, test, startup and turnover to operations a FBSR process and support systems in H-Area tank Farm using Building 241-96H to house the primary process system.

2.0 RISK MANAGEMENT PROCESS

2.1 Background

The Program ROMP (Reference 1) is maintained for the overall Liquid Waste System Plan execution at a high level to address the risks and opportunities that impact the program.

This ROAR provides the results of the TTP Project continuing assessment and will be periodically revised to incorporate updated information. The data developed and presented within this ROAR is an update to the data within the previous ROAR and is the baseline Risk Register for the TTP Project. The project team may add additional risks or opportunities to the risk register prior to any re-issuance of the report. This will allow timely evaluation and ensure handling strategies are developed as needed.

This report describes how the six steps of the risk management process (i.e. planning, identification, grading, handling, impact determination and integration) will be applied to this project and satisfies the requirements of providing a Risk and Opportunity Management Plan for the Project while also presenting the associated levels of risk, the risk handling strategies (RHSs) to be employed, the residual risk, the process for deriving management reserve (MR) and contingency and presenting the results of this process.

2.2 Team Members

As a minimum the Team comprised of the following personnel:

Name	Function
Carl Lanigan	DOE Federal Project Director
Charles Lampley	Tank Farm Operations
Jon Lunn	Project Manager
John Contardi	Project Engineering Manager
Mark Roupe	Project Controls Manager
Tim Heath	Deputy Project Manager
Srikant Mehta	Deputy Project Manager
Caroline Atseff	Design Authority
Steve Hall	Design Authority
Earl Brass	Design Authority
Sam Shah	Design Authority
Gary Cauthen	Design Authority
Gerry Eide	Design Authority
Celia Aponte	Design Authority
Sergio Mazul	Design Services
Thomas Colleran	Nuclear Safety Engineering
Mary Pallon	Construction Lead
Gavin Winship	Risk Management

During the course of the risk assessment representatives from other contributing organizations were requested to provide input for a specific set of risks or requested to sit on the team during the assessment meeting.

2.3 Risk Assessment Process and Methodology

Risk and opportunity assessments are conducted by formal meetings using a structured format to implement the risk assessment methodologies outlined in References 3 and 9. The major steps of the process are: Planning, Risk Identification, Risk Grading, Risk Handling, Impact Determination and Risk Integration which are discussed below.

Planning

Assessable elements were developed to guide the team though the scope of the risk assessment (Appendix 7.1). Standard likelihood criteria are used for all Projects, however for each project, consequence threshold criteria are tailored based on the overall cost of the project and importance of schedule to achieving Liquid Waste System Plan execution. Consequence criteria are shown in Appendix 7.3.

Identification

The identification process was performed in a brainstorming session with the team and subject matter experts by identifying the risks associated with each assessable element. To assist risk

identification a Risk Topics sheet (Appendix 7.4) that identifies risk typical types by area was used. Additionally, a Safety in Design Topics sheet (Appendix 7.5) was used to assist in identification of those specific risks associated with Safety in Design considerations.

Each identified risk was documented on a Risk and Opportunity Assessment Form (ROAF) (Appendix 7.8). Each has a documented basis, event and risk description to allow a full understanding of the risk.

Risks are also categorized as Contractor (SRR) owned or DOE owned. Risks are categorized as DOE owned where the contractor has no control over the risk event as in the case of external influences (e.g. new standards, regulations etc.)

Grading

The likelihood of risk occurrence was selected from the Risk Likelihood Table (Appendix 7.2) and a basis for the likelihood documented on the ROAF. The consequences (schedule impact and cost impact) of the risk occurring was then determined by the Team, the corresponding consequence identifier assigned from the Risk Consequences Table (Appendix 7.3) and a basis for the consequences documented on the ROAF. The likelihood and consequences were used in conjunction with Risk Level Matrix (Appendix 7.6) to determine the risk level.

Risk Handling

A RHS was developed for all risks by the Project Team. The RHS was documented on the ROAF, action items developed and responsibility for completion assigned. The following RHSs types can be employed:

Avoid – This strategy focuses on totally eliminating the specific risk-driving event. Once the RHS is implemented the risk will be reduced to zero, no residual risk remains with this strategy

Mitigate – This strategy identifies specific steps or actions to reduce the consequence or likelihood of the risk. There will be residual risk after the implementation of this RHS.

Accept – Accepting a risk is essentially a “no action” strategy. Selection of this strategy is based upon the decision that it is more cost effective to continue the activity as planned with no resources specifically dedicated to addressing the risk. The residual risk is equal to the initial risk with this RHS.

Impact Determination

If accept or mitigate is employed as a RHS, residual risk will remain after the RHS is complete. This residual risk was estimated and entered on the ROAF as quantified cost and/or schedule impact (worst, most likely and best cases) with an associated likelihood of occurrence.

Risk Integration

The data developed during this risk assessment is maintained electronically within the Project Risk Register and to assist in integration activities a risk owner has been assigned to each risk. Risk owners report on risk status using the riskometer (Appendix 7.9). Where helpful, risk triggers are tied to schedule activities. Risk triggers define the point at which a RHS must be completed to allow successful risk mitigation (trigger open) and the point at which risk may no longer be realized (trigger closed). Handling strategies are tracked on project action lists and where practical, incorporated into the Project Schedule. The cost of handling strategies is included in the Project Cost Baseline.

As new risks are identified and existing risks change, the Project Risk Register will be updated on a timely basis. Periodically this data will be used to produce updated ROAFs and will be issued in a revision to this report.

Additional guidance for performance of Risk Assessments is found in Manual E11, Conduct of Project Management and Controls, Procedure 2.62 (Reference 3), Manual S14, Procedure 1.12 Risk Management (Reference 9), and the Systems Engineering Methodology Guidance Manual (Reference 5).

2.4 Assumptions

Assumptions for the TTP Project are listed and discussed in detail within Reference 2. These assumptions were reviewed as part of this risk assessment and any risks associated with those assumptions identified and included in the risk data for the TTP Project.

3.0 RESULTS

The following update was performed to the TTP Project risks:

New Risks (10)

119 Materials Pricing Increases Vendor Costs
120 Additional Design Activities Required to Meet ASME VIII High Temperature Creep Criteria
121 DOE do not Accept Procurement Strategy
122 Testing of Auger Grinder Indicates Major Design Rework is Required
123 Design Comment Resolution Delays Design Completion
124 Process Optimization Continues After Flowsheets are Finalized
125 Numbering System Convention Changes
126 Vendor Underestimates Complexity of SRS SOW Requirements
127 Flow-down Requirements Imposed on Sub-vendors Impede Lower-tier Procurement Process

128 Refractory Damaged During Transportation

Closed (10)

018 Product Must Go to a Different Receipt Tank - This risk no longer applies to the TTP Project. TTP Project will provide a transfer path to DB7. At this point the Tank Farm Operations will direct the FBSR waste to an appropriate waste Tank (e.g. Tank 42, 51 or 39) considering the constraints of the sludge batching process. Any risks associated with the downstream impacts have been addressed in the TTP Project Risk Assessment and the Program Risk Assessment.

042 Discovery of Soil Contamination - This risk no longer applies as there are no potential contamination issues with excavation inside of the building and no significant excavation is being performed outside of 241-96H. Any delays/costs would therefore be contained within standard estimate and schedule uncertainty.

071 Unacceptable Ventilation Impact - Risk has been realized and trend has been initiated.

078 Scope reductions and conceptual phase CD-1 package assumptions do not materialize - Risks realized and impacts included within the baseline estimate.

079 Adequacy of Existing Floor Slab for the FBSR Skid - Risk has been realized.

086 Depleted Uranium is Required to be Added Prior to Transfer to Tank Farm Receipt Tank - This risk has not been realized. Reference Report SRR-LWP-2010-00034, Revision 0.

094 Startup/Shutdown or Process Upset Creates Material for Which There is no Disposition path - A recycle path has been provided by piping redesign. This risk is no longer credible.

113 SCDHEC/EPA Require Offgas and Product Stream Additional Sampling During Startup/Initial Operations -

114 Transport of Solids Creates Unacceptable Accident Consequences - Risk has not been realized, (Reference PCHA, WSRC-TR-2006-00288,and S-CLC-H-01189, Revision 0)

120 Additional Design Activities Required to Meet ASME VIII High Temperature Creep Criteria - This risk was closed during evaluation as high temperature creep is not considered a problem as these vessels are designed for a lower temperature than the IWTU vessels, and per code, are below the threshold for creep analysis.

After the update, 67 risks remained, (summarized in Appendix 7.7), 32 high risks, 23 moderate risks, 3 low risks 5 operational vulnerabilities, 3 Program risks and one risk for overall funding of the project. Risk handling strategies were developed for the 67 remaining risks as appropriate:

Risks Mitigated (49)
Risk Avoided (11)
Risks Accepted (7)

The resulting handled risks that would remain open with the potential to impact the project, based on the worst case impact assessed by the Team comprised of 12 high risks, 20 moderate risks, 12 low risks.

Also remaining open, but with no contribution to T&PRA were 8 operational vulnerabilities, 3 Program risks and one risk for overall funding of the project, requiring a project re-baselining if realized.

The following 7 risks were categorized as DOE-owned risks:

001 Funding Availability
007 DOE Directed Changes to Technical Requirements
012 Stakeholder Participation
016 Implementation of DNFSB Recommendation 2004-2 Required
033 Long Lead Procurement is Denied or Delayed
117 Additional Project Reviews are Required
118 Legacy Costs Increase
121 DOE do not Accept Procurement Strategy

No new opportunities were added. The following two opportunities were closed:

105 Use Existing Tank 48 Transfer Pump - The existing Tank 48 Transfer Pump is assumed not to work and a replacement is planned. An opportunity exists that the existing Tank 48 Transfer Pump can be tested, repaired as necessary and be qualified for use and avoid the expense of a new transfer pump. PM record search will be performed, the pump tested to identify problems and repaired as necessary. Opportunity has been realized

106 Use Existing Standby Nitrogen System Tanks for Liquid Oxygen Storage - Currently, the TTP Project is planning to procure and install oxygen storage and supply capability. HTF will deinventory the existing Standby Nitrogen System tanks located near the 241-96H Building. An opportunity exists that these tanks can be used for oxygen storage for the FBSR process. The existing design will be reviewed for compatibility with intended use as oxygen storage and if feasible, Management approval obtained for use of tanks. Opportunity could not be realized.

Refer to Appendix 7.7 for a summary of results.

4.0 SAFETY IN DESIGN

To ensure risks and opportunities relating to Safety in Design are highlighted as discussed within DOE Standard 1189 (Reference 6), the following is a listing of the specific Safety in Design risk associated with this Project:

013 Safety Basis not Accepted By DOE
016 Implementation of DNFSB Recommendation 2004-2 Required
019 Addition of the GAC to Design
020 Analysis of 241-96H Structure Shows Not-Qualified for II/I Concerns
023 Design Assumptions and Design Uncertainties Result In Rework

024 Insufficient Maintainability Provided
034 Waste Feed Line Plugs
046 Material Deposits Build up in Process Equipment During Operation (operational vulnerability)
059 Undefined Disposal Method for Waste Generated During Operations and Eventual Stand-by/Lay-up
070 Persistent Contamination Control Issues
073 Secondary Containment Required For Off-Gas and Secondary Confinement
075 Design/ Operational Life Is Inadequate
082 Organic Carries Over to Product Dissolution Tank
085 Maintenance Requires Remote Operations
086 Depleted Uranium is Required to be Added Prior to Transfer to Tank Farm Receipt Tank
093 Accident Analysis Determines Additional Safety Controls are Required
095 Accumulation of Solids in WFT, PDT, and/or PST
098 Sampling System Does not Perform as Designed
100 WFT and PST Cooling is Inadequate
111 Design Changes are Required to Achieve Performance Goals

5.0 CONCLUSIONS

5.1 Calculation of MR 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 schedule and estimate uncertainty. MR is funded, held by SRR and accessed by an appropriate change control mechanism and is sometimes referred to as "Contractor MR." Contingency is funded, held by the DOE and is sometimes referred to as "DOE Contingency". MR and Contingency are derived from the following components:

- Estimate Contingencies
- Schedule Contingencies
- T&PRA Contingencies

<u>Estimate Contingencies</u>

Estimate contingency addresses uncertainty within the project baseline. Estimate contingency will be established through the completion of a Monte Carlo simulation using BECRAC® analysis software. This software utilizes a probabilistic determination method and yields the probability of overruns or under runs to the total project cost. The Monte Carlo simulation model represents the summary of the logic and overall approach for the preparation of the project cost estimate. The methodology establishes the major components of the estimate called "terms" such as construction cost, labor cost, project support costs, and utilizes the estimate for these

terms to establish a weighting for each for use in the simulation model. The project team establishes the major elements of uncertainty in the estimate based upon knowledge of the work scope.

Based on the judgment of the project 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 estimate, a Crystal Ball® simulation run is conducted to establish the cost estimate contingency at the 50 and 80 percent (%) confidence levels.

Schedule Contingencies

Schedule contingency addresses uncertainty within the project schedule baseline. Items addressed are schedule logic, activity durations, resource availability, planned work processes and schedule impact from T&PRA identified risks. Schedule contingency is developed using a Monte Carlo technique with Primavera® (or equivalent) Risk Analysis software. Schedule impacts for contingency are developed with a Range of Durations analysis and a Probabilistic Branching modeling analysis. The Range of Durations analysis is developed using (Optimistic, Most Probable, and Pessimistic) duration impacts on each activity. The Probabilistic Branches used for analyses are defined from the risk registers developed in the T&PRA risk assessment within this ROAR. The results of the analysis added probable schedule duration required to achieve a 50% and 80% confidence of completion. Contingency activities are 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 derived and contributes to the derivation of MR and contingency to account for the associated extension of time.

Technical and Programmatic Risk Assessment (T&PRA) Contingencies

T&PRA cost contingency is developed based on the residual risk impacts identified by the Team during the project risk assessment as documented in this ROAR. As described earlier, the team develops residual probability and best, most likely and worst case impact cost during the project risk assessment for each discrete risk. A cost probability distribution is developed for each risk using Crystal Ball® software. The software is 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 funding for the Project at the 50% and 80% confidence levels.

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 50% confidence level (CL).

Contingency

Contingency (or DOE owned Contingency) is defined as the difference between 50% and 80% contingency for Contractor risks, plus the full cost and schedule contingency to achieve a 80% CL for DOE owned risks.

5.2 Results

The calculated contingencies were as follows:

Component	SRR MR	DOE Contingency
Estimate	$6,859,523	$8,497,619
Schedule	$3,634,960	$1,590,663
T&PRA	$4,515,960	$12,651,500
Total	**$15,010,443**	**$22,739,782**

To achieve an 80% confidence level, the required schedule contingency was calculated to be **7** Months.

It must be noted that although the required 80% confidence level is attained by providing the TTP Project with fully funded T&PRA based contingencies, a risk remains (DOE-owned risk 016), that if realized in the worst case could result in the need for an active confinement ventilation system:

016 Implementation of DNFSB Recommendation 2004-2 Required

If this risk is realized, and the impact is the worst case, it would exceed the current risk-based T&PRA contingencies. Project management will focus on mitigating this risk as a priority early in the TTP Project life cycle to avoid the potential for re-baselining of the project should the worst case impact be realized.

5.3 Continuing Risk Management

As part of the ongoing project activities, risk statusing and tracking will be performed on the TTP Project. RHSs will be included in the Project schedule and within the Project action item database. As new risks are identified by the Project Team they will be assessed and RHSs

developed and implemented. Periodically these risks and updates to existing risks will be issued in a revision to this report. This process will continue for the life of the Project. These activities are detailed in Reference 9.

6.0 REFERENCES

1. Y-RAR-G-00022, PBS-SR-0014, Radioactive Liquid Tank Waste Stabilization and Disposition, Risk and Opportunity Management Plan, Revision 6, June 2010.
2. G-TC-H-00046, Task Requirements and Criteria, Tank 48 Disposition by Fluidized Bed Steam Reforming Project, Revision 7, August 5, 2010.
3. WSRC Manual E11, Conduct of Project Management and Controls, Procedure 2.62, Revision 11, September 15, 2010, Project Risk and Opportunity Analysis.
4. SRR-LWP-2009-00001, Liquid Waste System Plan, Revision 15, January 2010.
5. Systems Engineering Methodology Guidance Manual, WSRC-IM-98-00033, Appendix B Risk Management, Revision 7, March 1, 2008.
6. DOE-STD-1189-2008, DOE Standard, Integration of Safety into the Design Process, March 2008.
7. Letter, Hawking to Burnau, Revised Direction for the Development of the Contract Performance Baseline, February 4, 2010.
8. DOE Order 413.3A, Program and Project Management of Capital Assets.
9. Manual S14, Procedure 1.12, Risk Management, Revision 1, March 12, 2010.

7.0 APPENDICES

7.1 Assessable Elements

7.2 Risk Likelihood Table

7.3 Risk Consequences Table

7.4 Risk Topics

7.5 Safety in Design Topics

7.6 Risk Level Matrix

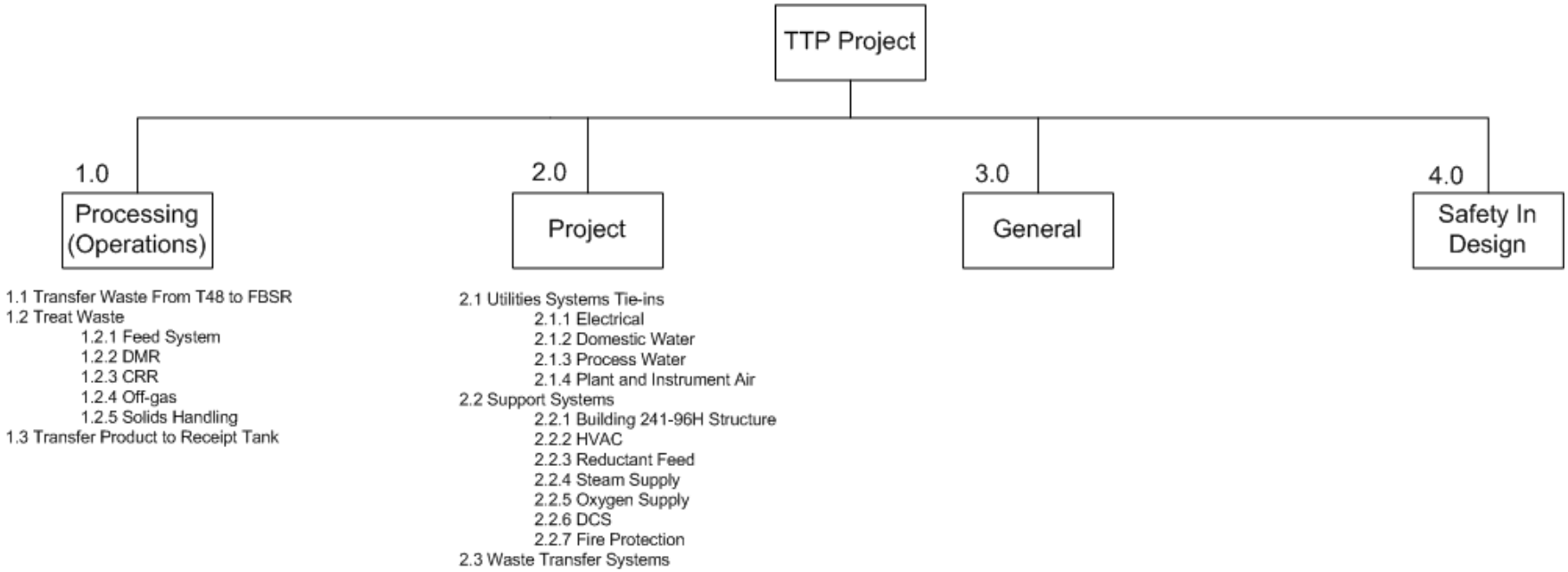
7.7 Risk Summary Table

7.8 Risk and Opportunity Assessment Forms

7.9 Riskometer

7.10 T&PRA Analysis

7.1: Assessable Elements



7.2: Risk Likelihood Table

Likelihood of Occurrence	Criteria
Very Unlikely (>0 but <0.15)	Will most likely not occur in the life cycle of the project
Unlikely (≥0.15 but <0.45)	Will likely not occur in the life cycle of the project
Likely (≥0.45 but <0.75)	May occur sometime during the life cycle of the project
Very Likely (≥0.75)	Will likely occur sometime during the life cycle of the project

7.3: Risk Consequences Table

Consequence of Occurrence	Criteria
Negligible (<0.15)	Minimal consequences, unimportant. Some potential transfer of money, but budget estimates not exceeded, up to $50K. Negligible impact on project, slight potential development schedule change (≤ 1 week), compensated by available schedule float.
Marginal (0.15 - < 0.45)	Small, acceptable, reduction in modification project technical performance. Cost estimates exceed budget > $50K to ≤ $250K. Minor slip in schedule (> 1 week up to 2 weeks) with some potential adjustment to milestones required.
Significant (0.45 - < 0.75)	Significant degradation in modification/project technical performance. Cost estimates exceed budget by > $250K to ≤ $1.5M. Significant slip in schedule (> 2 weeks up to 2 months) resulting in milestone changes that may affect facility mission.
Critical (0.75 - < 0.9)	Technical goals of modification/process cannot be achieved. Cost estimates seriously exceed budget by > $1.5M to ≥ $3M. Excessive schedule slip (> 2 months up to 3 months) possibly affecting overall facility mission.
Crisis ≥ 0.9	Modification cannot be completed within the constraints of existing schedule and budget. Cost estimates unacceptably exceed budget by > $3M or more. Schedule slip (>3 months); possibly causing loss of mission.

7.4: Risk Topics

Design

- Undefined, Incomplete, Unclear Functions or Reqs
- Complex Design Features
- Numerous or Unclear Assumptions or Bases
- Reliability
- Inspectability
- Maintainability
- Safety Class
- Availability
- Errors and Omissions in Design

Regulatory & Environmental

- Environmental Impact Statement Req'd. (EIS)
- Additional Releases
- Undefined Disposal Methods
- Permitting
- State Inspections
- Order Compliance
- Regulatory Oversight

Safeguards & Security

Category I nuclear materials

- Classified process / information

Technology

- New Technology
- Existing Technology Modified
- New Application of Existing Technology
- Unknown or Unclear Technology

Procurement

- Procurement Strategy
- First-use Subcontractor/Vendor
- Vendor Support

Construction Strategy

- Turnover/Start-up Strategy
- Direct Hire/Subcontract
- Construction/Maintenance Testing
- Design Change Package Issues

Testing

- Construction
- Maintenance
- Operability
- Facility Startup
- System Startup (Subcontractor or PE&CD)

Resource/Conditions

- Material/Equipment Availability
- Specialty Resources Required
- Existing Utilities Above and Underground
- Support Services Availability
- Geological Conditions
- Temporary Resources (Power, Lights, Water, etc.)
- Resources Not Available
- Construction Complexities
  - Transportation
  - Critical Lifts
  - Population Density
- Escorts
- Personnel Training & Qualifications
- Tools, Equipment Controls & Availability
- Experience with system/component (design, operations, maintenance)
- Work Force Logistics
  - Operations Support
  - Health Physics
  - Facility Support
  - Facility Maintenance Centralized Maintenance
  - Construction Support Post Modifications
- Training
- Research and Development Support
- Multiple Project/Facility Interface
- Facility Work Control Priorities
- Lockout Support

Safety

- Criticality Potential
- Fire Watch
- Exposure Contamination Potential
- Authorization Basis Impact
- Hazardous Material Involved
- Emergency Preparedness
- Safeguards & Security
- Confinement Strategies

Management

- Funding uncertainties
- Stakeholders Program Strategy Changes
- Errors and Omissions in Estimates
- Fast track/critical need
- Infrastructure influence

Safety/ISMS

- Established operating practices
- Established, proven operating procedures
- Requires changes to AB documents or new USQ
- Unique operating logistics required
- Additional operations personnel required
- New TSR) limits or surveillance's
- Limited access/egress
- Complex emergency/off-normal operational steps
- Equipment reliability

Security

- New security systems required
- New security practices required
- Additional security personnel required
- Revised MC&A requirements

Mission

- Affect other facility/site missions
- Interfacing with off-site organizations required
- Shipment to off-site locations required
- Operation susceptibility to external intervention

Integration

- Work included in division/area/facility master schedule
- Design/construction schedule conflicts
- Other site division involvement

Waste Management

- New waste streams generated
- New waste management practices being implemented
- Additional quantities of waste being generated

Interfaces

- Multiple Agencies, Contractors
- Special Work Control/Work Auth. Procedures
- Operating SSCs Including Testing
- Multiple Customers
- Co-Occupancy
- Outage Requirements
- Multiple systems
- Radiological Conditions (Current and Future)
  - Contamination
  - Radiation
- Multiple Projects
- Proximity to Safety Class Systems

Operation

- Non-routine and/or complex operation
- Routine operational stoppages required
- Analytical sampling required during operations

Engineering/R&D

- Newly deployed technology
- Transient technology, replacement component differ

Infrastructure

- Equipment operating beyond intended/useful life
- Support facility reliability (steam, waste, etc.)
- Spare parts availability

Facility Capability

- Additional capital funded/project requirements
- Modification to existing project scope

7.5: Safety in Design Topics

Functional Areas	
Design	**Technology**
Undefined, Incomplete, Unclear Process or Safety Functions or Requirements • Potential impact to confinement ventilation strategy • Potential impact to functional classification of SSCs	New Technology application or new application or existing technology • hazards and upset conditions may not be well understood • material form may be one not previously studied for Airborne Release Fraction (ARF) • toxicological effects may not have sound basis
Complex Design Features • Security requirements and impact on safety analysis • Safety-related control system design, interface with safety analysis, and implementation	Unknown or undecided technology • Potential for different materials at risk (MAR) should be assessed with resultant impact to NPH categorization and SSC functional classification • Potential for additional or exacerbated accident scenarios
Assumptions on key utility interfaces • Capacity • Equipment compatibility • Safety precautions in existing utilities • Reliability of existing utilities	Scale-up of bench scale technology or process or technology application maturity • Production quantities could introduce unknowns in hazard behavior or material interactions
Design Basis Threat requirements • Potential for changes affecting seismic design or hazards analysis	
Deferred capability decisions (where hazards could be introduced or increased with added capability in the future) • Potential for added capacity (MAR and SSC functional classification impact) • Potential for addition of significant mass to structure affecting seismic analysis • Potential for impacting confinement ventilation system	
Safety Class SSC selection confidence • Management judgments related to selection of borderline SSC classifications should be identified • Assumptions critical to consequence results with potential for change (e.g., ARF)	
Assumptions regarding production objectives • Increases in production objectives could affect MAR, NPH categorization, and/or SSC functional classification	
Errors and Omissions in Design • Potential for impact to MAR, NPH categorization, and/or SSC functional classification	

Functional Areas	
Seismic design margin • 10-year site hazard reevaluation (e.g., change in seismic hazard curve) requirement may impact NP design basis for long-term design/construct projects Criticality Design Criteria • Ill-defined criteria can result in potential miscommunication between design disciplines and criticality safety	
Fire Protection • Failure to identify and comply with design requirements of codes, standards, and directives • Failure to integrate FHA with facility hazards analysis • Rigorous fire hazards is necessary to define facility fire mitigation design basis	Field Quality Control • Field installation/Quality Control errors during structure construction can result in design changes to protect seismic basis, separation requirements, etc.

7.6: Risk Level Matrix

		RISK LEVEL				
PROBABILITY	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
	Non-Credible	Low	Low	Low	Low	Low
		Negligible	Marginal	Significant	Critical	Crisis
		CONSEQUENCES				

7.7: Risk and Opportunity Summary Table

Risk ID	Risk Title	Likelihood	Consequence	Risk Level (Initial)	Handling Strategy	Description	Residual Risk Level
001	Funding Availability	Likely	N/A	N/A	Mitigate	Keep Senior Management informed about project needs/progress. Ensure required funding is approved and if funding becomes unavailable, effect a baseline change proposal to project.	N/A
002	Interfaces with Other Facilities and Projects	Very Likely	Significant	High	Mitigate	Keep H-Tank Farm Facility Project Owners & Managers informed about project needs/progress. Maintain integrated project schedule with appropriate logic ties between project & facility activities.	Moderate
003	Sampling and Analysis Turnaround Impacts Production	Likely	Significant	Moderate	Mitigate	Develop Sample & Analytical Plans well in advance of actual operations including a strategy where a sample of every transfer is not required, i.e. take weekly or monthly samples similar to what is done for the evaporator overheads. Ensure Lab back-up instrumentation is available in case of equipment failure. Develop a contingency plan if analytical results are not available, i.e. tighten the acceptable tolerance of the latest sample to verify results and to justify continued operation. This risk however would occur during hot operations, therefore it is an operational vulnerability and does not have any residual risk to the project.	N/A
004	Accessibility for Construction Work	Very Likely	Significant	High	Mitigate	Coordinate work with operations and other projects through participation in facility Work Window Lock-ins, 8 Week Lookaheads (T8s), and Plan of the Days (PODs). When activities are locked in, ensure critical resources (i.e. rigging, radcon, IH, etc.) are onboard and ready to support.	Moderate

Risk ID	Risk Title	Likelihood	Consequence	Risk Level (Initial)	Handling Strategy	Description	Residual Risk Level
007	DOE Directed Changes to Technical Requirements	Likely	Crisis	High	Accept	Changes to the Technical baseline imposed by DOE would be a change in project scope and a BCP would be generated to move funding from DOE contingency.	High
008	Availability of Construction Equipment	Unlikely	Significant	Moderate	Accept	This risk is accepted based on priority being requested for on-site crane. Although priority for crane usage is requested, a higher priority could still "bump" this project.	Moderate
009	Readiness/ORR Assessment Findings	Unlikely	Significant	Moderate	Mitigate	Project Team develop and perform detailed management checklist prior to beginning RA. Continued engagement of DOE, Operations and Safety organizations in the system design reviews and testing activities. DOE Operations and Safety organizations to participate in test activities conducted before the DOE ORR. Engage the DOE ORR Team prior to the SAT to enable the team to become familiar with the systems and operations.	Low
011	Unsafe Conditions Discovered at Turnover	Unlikely	Significant	Moderate	Mitigate	Operations, Safety, Engineering, Industrial Hygiene, Construction, QA and Maintenance to participate in design reviews and monthly walkdowns.	Moderate
012	Stakeholder Participation	Likely	Significant	Moderate	Mitigate	Develop communication plan for involving stakeholders. Keep Stakeholders/Senior Management informed of R&D results. If stakeholders do impose additional design/operational /research/testing requirements on the project a BCP will be developed to obtain additional funding from DOE contingency. As an ongoing part of project execution the Integrated Project Team will be utilized to communicate information to Senior Management and determine actions for additional stakeholder needs as they develop.	Moderate

Risk ID	Risk Title	Likelihood	Consequence	Risk Level (Initial)	Handling Strategy	Description	Residual Risk Level
013	Safety Basis not Accepted By DOE	Very Unlikely	Crisis	High	Mitigate	Ensure DOE involvement during development of the Safety Design Strategy (SDS) to avoid last minute surprises. DOE will participate in the CHA meetings, SIRCs and Safety Design Integration Team meetings. SRR will obtain DOE approval of interim documents such as the SDS, Conceptual Safety Design Report, Preliminary Safety Design Report and Preliminary Documented Safety Analysis. DOE has established a Technical Authority Board to review these interim documents.	Low
014	Resources Not Available	Likely	Significant	Moderate	Mitigate	Establish project baselines and key contract milestones. Maintain timely funding authorizations and accurate resource forecasts for all support management organizations.	Moderate
016	Implementation of DNFSB Recommendation 2004-2 Required	Unlikely	Crisis	High	Accept	The TTP Project Design strategy complies with current DOE orders and site procedures. There are no additional handling strategies that can be applied.	High
019	Addition of the GAC to Design	Very Unlikely	Crisis	High	Mitigate	Complete analysis of Hazen test data and flowsheet development and work with environmental to determine that the GAC bed indeed is not required in sufficient time to minimize schedule impact.	Moderate
020	Analysis of 241-96H Structure Shows Not-Qualified for II/I Concerns	Unlikely	Crisis	High	Avoid	Perform the II/I Analysis during preliminary design to identify impacts prior to baselining the project. Design project to II/I criteria.	None
022	Interfaces With New Contractor Impacts Project	Unlikely	Crisis	High	Mitigate	Ensure early involvement of subcontractor in preliminary design. Expedite preliminary design.	High

Risk ID	Risk Title	Likelihood	Consequence	Risk Level (Initial)	Handling Strategy	Description	Residual Risk Level
023	Design Assumptions and Design Uncertainties Result In Rework	Unlikely	Crisis	High	Mitigate	Determine the need for new electrical substation. Develop and issue a viable automation and controls strategy. Evaluate off-gas composition and potential personnel exposure.	Moderate
024	Insufficient Maintainability Provided	Likely	Critical	High	Mitigate	Have Maintenance, Ops and Rad Con involved in the design to ID and resolve issues during the design of the skid.	Moderate
027	Availability of Consumables	Likely	Significant	Moderate	Mitigate	Perform identification of critical spares/resources. Set up parts in stores. Where practical, consumables critical to this project and with lead times greater than one week shall be set up in site stores.	Low
028	Waste Feed Nozzle Deposits	Likely	N/A	N/A	Mitigate	Perform ESTD testing with Tank 48 simulant. Engineering Scaled Testing Lessons Learned will be incorporated into clean in place design. Inspect DMR feed nozzle for deposits after ESTD testing. This risk is an operational vulnerability.	N/A
029	Scale-up of FBSR Process Encounters Problems	Unlikely	N/A	N/A	Avoid	The Hazen tests will validate design flow rates of Tank 48 simulate feed. Expected flow rate will be based on a smaller 15" DMR bed unit. The design for the Tank 48 unit will be approximately 26" bed DMR. The inability of the scaled-up FBSR to meet throughput requirements is not considered a risk to the project, however this is an issue that will impact the LLWDSP. Use the Hazen test results to validate design flow rates of Tank 48 simulate feed; perform elutriation and material & energy balance calculations; and perform computational fluid dynamics (CFD) modeling. This risk is an operational vulnerability that will be avoided.	None

Risk ID	Risk Title	Likelihood	Consequence	Risk Level (Initial)	Handling Strategy	Description	Residual Risk Level
033	Long Lead Procurement is Denied or Delayed	Likely	Crisis	High	Mitigate	Project schedule includes request of early approvals of long lead procurements in order to obtain early DOE agreement on strategy. If this risk were to be realized, a BCP will be developed to obtain funding from DOE contingency to compensate for realized schedule impacts.	High
034	Waste Feed Line Plugs	Likely	Significant	Moderate	Avoid	Thor Treatment Technologies (TTT) to assess potential for DMR feed nozzle plugging based on potential particle size limitations associated with the process and specify proposal for risk potential mitigation/elimination.	
038	Availability Cannot be Achieved	Unlikely	Critical	Moderate	Mitigate	Vendor is required to perform a RAMI analysis on the system. Have Vendor engineers on hand during vendor testing, startup and cold runs. This is not considered a risk to the project, as risk during startup has been avoided, however this is an operational vulnerability that could impact the System Plan.	
043	Engineered Equipment (Modules/Skids) Deliveries do not Support Project Schedule	Likely	Critical	High	Mitigate	Have an expeditor assigned to the Project Team to expedite and track procurements.	Moderate
046	Material Deposits Build up in Process Equipment During Operation	Likely	N/A		Mitigate	Analyze material samples collected from Hazen testing. Inspect DMR for build-up during all testing and develop ops and maintenance procedures for preventing build-up or cleaning during radioactive operation. This risk will not impact the project, however will remain as a potential operational vulnerability.	

Risk ID	Risk Title	Likelihood	Consequence	Risk Level (Initial)	Handling Strategy	Description	Residual Risk Level
050	Tank Farm Equipment Failure	Unlikely	N/A	N/A	Accept	This risk is accepted as handling of this risk is presently being performed by Tank Farm operations by establishing system health evaluation of key systems that can impact major processing activities. Implementing the requirements of the evaluation e.g. ensuring adequate spare parts/equipment are identified and on hand is being performed to support facility operations. Completion of this program risk handling strategy will bring the probability and consequence of equipment failure to levels that are acceptable, no longer considered as a risk and have no impact to the Project. It may remain an operational vulnerability.	N/A
056	Facility Support System Capacity/Life	Unlikely	N/A	N/A	Mitigate	Determine the utility needs earlier during preliminary design and verify their availability. Have maintenance and Ops verify that the utilities are in good working order during the design phase. Schedule impact avoided. Ensure the process design can handle anticipated support system unplanned interruptions without undue consequences by either prevention (e.g. safe shutdown, stand by mode, etc.) or by including means to recover (e.g. flushing). TTP Project will ensure that site utilities are have adequate capacity, however, the continued addition of other projects and the age of the utility systems will remain an operational vulnerability.	N/A
057	Integration of Multiple Internal Technical Agencies	Likely	Critical	High	Mitigate	Assign a PEM to coordinate this effort and have regular Engineering Meetings with the total engineering team.	Low
058	Multiple Design Input Documents	Very Unlikely	Marginal	Low	Mitigate	Assign a PEM to coordinate this effort and have regular Engineering Meetings with the total engineering team.	Low

Risk ID	Risk Title	Likelihood	Consequence	Risk Level (Initial)	Handling Strategy	Description	Residual Risk Level
059	Undefined Disposal Method for Waste Generated During Operations and Eventual Stand-by/Lay-up	Unlikely	Significant	Moderate	Avoid	Identify disposal path upfront in preparation for filter, DMR/CRR bed material/fouled components replacement.	None
061	Facility Space and Weight Limitations	Likely	Crisis	High	Mitigate	Asbuilt available space within the building. Make the space availability/weight limits a requirement for the FBSR Vendor.	High
062	Project Strategy Does Not Support Tank 48 Return to Service Need	Very Likely	N/A	N/A	Accept	If Tank 48 can not be returned to service to support the System Plan, future Tank Closure commitments may not be achieved. This is not a risk for the Project, however it is an issue to be resolved by the LWO Planning Group. (Reference PBS-SR-0014, Risk 184).	N/A
063	FBSR Equipment Transportation Requires Additional Precautions	Very Unlikely	Significant	Low	Mitigate	Plan up front in the design of the skids and coordinate with the Vendor to ensure special vehicles are available. Perform receipt inspection.	Low
064	Multiple External Interfaces	Likely	Critical	High	Mitigate	Schedule early approval of long lead procurements to ensure critical vendor information is available in a timely fashion. Integrate project activities into facility schedule. Establish project milestones to manage schedule float and visibility of project priorities.	Low
066	Emergent Startup Issues	Very Likely	Crisis	High	Mitigate	Incorporate lessons learned. Ensure sufficient time is allotted for operator/startup training.	Moderate
069	Facility Services Design Complexity	Unlikely	Significant	Moderate	Mitigate	Specify and/or coordinate the tie-in point in the specification or during the review and approval of the Vendor design.	Low

Risk ID	Risk Title	Likelihood	Consequence	Risk Level (Initial)	Handling Strategy	Description	Residual Risk Level
070	Persistent Contamination Control Issues	Unlikely	Significant	Moderate	Mitigate	Design equipment and facility for ease of decontamination. During cold runs, investigate potential contamination pathways and perform NDE per appropriate code (e.g. Hydrostatic testing, weld UT/MT/PT or rad inspection.	Low
072	Module Handling and Installation	Likely	Marginal	Moderate	Avoid	Ensure requirements are placed in procurement specification for handling equipment to be provided by the vendor. Review vendor design and lifting procedures. Review mode. Perform constructability reviews.	None
073	Secondary Containment Required For Off-Gas and Secondary Confinement	Very Unlikely	Significant	Low	Avoid	Design ductwork as Level 5.	None
075	Design/ Operational Life Is Inadequate	Likely	Crisis	High	Mitigate	Develop procurement specification to ensure a robust design of major equipment. During startup testing, focus on identification of adverse indications that may reduce life expectancy and correct whenever feasible. Perform a RAMI analysis. Even with a robust design and minimization of adverse operational impacts to the system, an operational vulnerability remains that a failure could occur by operating the system outside of the planned operational life. This does not impact the project and the vulnerability has been accepted by operations.	N/A

Risk ID	Risk Title	Likelihood	Consequence	Risk Level (Initial)	Handling Strategy	Description	Residual Risk Level
076	Aggressive Post Installation Testing Schedule	Likely	Significant	Moderate	Mitigate	PS SSCs require a commensurate level of QA, these activities will normally include QA inspection, witnessing vendor validation/component testing/critical installation points, ensuring lessons learned are documented, reviewing and approving vendors QA, assuring SOW Engineering documents/inspection and examination procedures/startup procedures/SOW testing plans and procedures are statused 1 or 5. Additionally: Assure that the validation test lessons learned are incorporated into the FBSR design; develop and issue project specific QA Plan. Assign startup engineers/operators to Idaho startup.	Low
082	Organic Carries Over to Product Storage Tank	Unlikely	Significant	Moderate	Avoid	Provide a design constraint to the vendor at initial design for preventing organics from entering the PDT. Ensure the feature meets our needs during design review process. Provide sampling recycle capability.	None
083	DWPF Processing Impacted by FBSR Product	Likely	N/A	N/A	Mitigate	The TTP Project will perform the following to assist mitigation of Program impacts: evaluate process for FBSR output in the final product stream; develop modeling for sludge batch with FBSR output; and require the vendor to perform elutriation and carryover calculations. (Reference PBS-SR-0014 Risks 034, 048, 083, 120 and 145).	N/A

Risk ID	Risk Title	Likelihood	Consequence	Risk Level (Initial)	Handling Strategy	Description	Residual Risk Level
085	Maintenance Requires Remote Operations	Likely	Crisis	High	Mitigate	During design, assure all items requiring maintenance are designed and located for easy access, removal and replacement to reduce maintenance time. Vendor is required to provide input to shielding calcs. Where possible provide shielding portals for access and rigging/hoisting points that take advantage of available distance and shielding. Determine if any equipment bails, hoist attachments, or camera views would be beneficial for some equipment maintenance activities. SRR operations and maintenance will be engaged with vendor in developing design features to allow cleaning to minimize dose.	High
087	High Silica Content Creates a Processing Problem at 2H Evaporator	Likely	N/A	N/A	Mitigate	The TTP Project will perform the following to assist mitigation of Program impacts: perform evaluation to determine soluble silica expected in the Tank Farm receipt tank; evaluate impact to 2H evaporator system and determine is additional action is required to reduce/remove silica. (Reference PBS-SR-0014 Risks 116 and 367).	N/A
093	Accident Analysis Determines Additional Safety Controls are Required	Unlikely	Critical	Moderate	Mitigate	Specify materials as Quality Level 2 (equivalent to SS) during initial procurement to allow early procurement and avoid schedule delays. Pursue testing of DMR and PSF coal/product for combustion.	Moderate
095	Accumulation of Solids in WFT, PDT, and/or PST	Likely	Significant	Moderate	Avoid	Use mixing/agitation to suspend the insoluble and designing transfer systems capable of transferring slurried solutions will avoid this risk.	None

Risk ID	Risk Title	Likelihood	Consequence	Risk Level (Initial)	Handling Strategy	Description	Residual Risk Level
098	Sampling System Does not Perform as Designed	Likely	Crisis	High	Avoid	Revise the current Sampling Strategy for the FBSR system (Ref. LWO-SPT-2008-00116) to confirm sampling needs for the FBSR system and tank farm receipt tank early in the preliminary design phase. Prepare a Sampling Plan, obtain concurrence from operations and incorporate into the projects TR&C. During the sampling design development ensure buy in from maintenance and operations. Risk is avoided.	None
100	WFT and PST Cooling is Inadequate	Unlikely	Significant	Moderate	Avoid	Perform analysis during preliminary design to confirm adequacy of tank cooling capacity and cooling control system.	None
102	DWPF Particle Size Requirements Not Met	Likely	Crisis	High	Mitigate	Refine data on expected bauxite concentration, perform additional testing and develop a path forward early in project.	High
103	Doorstops Are Not Available As Needed to Support Sampling Activities	Likely	Critical	High	Mitigate	Perform identification of spare doorstops at SRS. Perform radiological dose estimate/calculation to determine shielding requirements for samples. Determine if the doorstops identified meet the radiological requirements. In parallel initiate Procurement Process to purchase acceptable spares identified from SRNS and initiate Procurement Process for fabrication of remainder of doorstops.	Moderate
104	SCDHEC Permitting Engineering Resources Are Not Available	Likely	Significant	Moderate	Mitigate	Actively engage SCDHEC in permitting process through information meetings, site visits, etc. Ensure local SCDHEC office is involved in discussions with SCDHEC permit engineer in Columbia. Ensure all braches of SCDHEC are involved during permit discussions.	Moderate

Risk ID	Risk Title	Likelihood	Consequence	Risk Level (Initial)	Handling Strategy	Description	Residual Risk Level
108	SCDHEC IWT Construction Permit Issuance Is Delayed	Likely	Crisis	High	Mitigate	Develop input data and permit package to ensure it will comply the SCDHEC requirements for a construction permit application.	High
109	Non-Rad (SCDHEC-BAQ (Bureau of Air Quality) Construction Permit is Delayed	Likely	Crisis	High	Mitigate	Develop data and perform calculation to determine emission levels of unit in sufficient time to incorporate mitigating modifications in design to ensure permit thresholds will not be exceeded.	Low
111	Design Changes are Required to Achieve Performance Goals	Likely	Critical	High	Mitigate	Request information from TTT on process upsets and impacts to operational recovery. Perform evaluations of site equipment reliability and provide recommendations to management. The residual risk would be an operational vulnerability if the controls/redundancies either cannot be provided or do not fully resolve the problem.	N/A
112	During Startup Additional Samples Are Required	Likely	Crisis	High	Mitigate	Evaluate statistically the need for more than 7 samples based on previous operational experience with MCU. Develop additional capabilities in F-Area Lab.	Moderate
117	Additional Project Reviews are Required	Likely	Critical	High	Accept	There is no effective handling strategy that can be employed to mitigate this risk. It is outside the control of the Project Team. If this risk is realized, a BCP will be developed to obtain additional funding from DOE contingency.	High
118	Legacy Costs Increase	Likely	Crisis	High	Accept	There are no strategies to control the fluctuations in Legacy costs. If this risk is realized, a BCP will be developed to obtain additional funding from DOE contingency.	High

Risk ID	Risk Title	Likelihood	Consequence	Risk Level (Initial)	Handling Strategy	Description	Residual Risk Level
119	Materials Pricing Increases Vendor Costs	Unlikely	Crisis	High	Mitigate	TTT to identify materials of construction early and seek early SRR approval to enable procurement. A LLP Plan is being developed by TTT to allow early ordering of materials. TTT will continue to monitor material availability/pricing and make adjustments to estimates as necessary.	Moderate
121	DOE do not Accept Procurement Strategy	Unlikely	Crisis	High	Mitigate	SRR will meet regularly with DOE and provide update on any changes to procurement strategy.	High
122	Testing of Auger Grinder Indicates Major Design Rework is Required	Likely	Significant	Moderate	Mitigate	TTT to evaluate the Tank 48 Phase 1 and 3 test results relative to Auger Grinder performance and incorporate lessons learned into design. TTT to monitor test results from IWTU Auger Grinder test and if necessary design modifications and use lessons learned in the Tank 48 Auger Grinder Design.	Moderate
123	Design Comment Resolution Delays Design Completion	Unlikely	Significant	Moderate	Mitigate	Provide resident personnel to socialize issues with TTT early and resolve prior to reviews. SRR to discuss comments with TTT to ensure all are clearly understood before disposition begins.	Low
124	Process Optimization Continues After Flowsheets are Finalized	Likely	Crisis	High	Avoid	Assign a PEM responsible for approval of flowsheet changes and coordination with design. Install and exercise change control over the TTP Process Flowsheet.	None
125	Numbering System Convention Changes	Unlikely	Significant	Moderate	Mitigate	Develop and deploy a change control process.	Moderate

Risk ID	Risk Title	Likelihood	Consequence	Risk Level (Initial)	Handling Strategy	Description	Residual Risk Level
126	Vendor Underestimates Complexity of SRS SOW Requirements	Likely	Crisis	High	Mitigate	Vendors to evaluate high potential requirements and communicate impacts to SRR. Use RFIs and SDDRs to communicate issues and resolution. Develop and deploy change control.	High
127	Flow-down Requirements Imposed on Sub-vendors Impede Lower-tier Procurement Process	Likely	Significant	Moderate	Mitigate	Primary vendor to: develop a contract deliverables list to accurately identify documents required to be submitted or generated at the time of submittal; review design specifications to assure only "Code Required" and "Contract Required" documents are listed, minimizing unnecessary submittals; assure all submittal requirements are clearly understood by having Fabrication Manager, Engineering Manager and ESH&Q Manager meet with sub-vendor; ensure Procurement Manager, Engineering Manager and ESH&Q Manager review purchasing documents to assure submittals are properly included.	Moderate
128	Refractory Damaged During Transportation	Likely	Critical	High	Mitigate	Ensure the refractory plan includes specific and adequate transportation precautions against damage to the refractory.	Moderate

7.8: Risk and Opportunity Assessment Forms

Risk / Opportunity Assessment Form

ID Number: 001 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Funding Availability			
Type: Risk External Programmatic	**Category:** DOE		
Assess. Element: 3.0	**Title:** General		
Responsible Org: SRR-PM - Project Manager	**Contact:** Jon Lunn	**Date Identified:** 12-Oct-06	
Statement of Event: Project must be adequately funded to be successful. Funding falls short of project needs. Project cannot be completed within baseline schedule.			
Likelihood:	Likely	**Basis:** Funding short falls occur with regularity.	
Consequence / Benefit:	N/A	**Basis:** Schedule delay up to and including demobilization and placing project on hold.	
Most Significant Cost Impact ($k): N/A	**Most Significant Schedule Impact:** N/A		
Level:		**Event Trigger:** Open-Currently open / Close-"CD-4 DOE Approval" (WH48CD-106)	
Handling Strategy:	Mitigate	**Description:** Keep Senior Management informed about project needs/progress. Ensure required funding is approved and if funding becomes unavailable, effect a baseline change proposal to project.	
Handling Strategy Action Items: 001-1 Keep Senior Management informed about project needs/progress., , , Jon Lunn, 001-2 Ensure required funding is approved and if funding becomes unavailable, effect a baseline change proposal to project., , , Jon Lunn,			
HS Implementation Cost ($K):	0	**Basis:** Cost will be within the Project baseline for PM activities.	
HS Implementation Schedule:	Ongoing	**Basis:** This activity will be performed for the entire length of the Project.	
Other Handling Strategies:			
Statement of Residual Risk: As a BCP will be initiated upon realization of this risk, no residual risk to the project exists.			
Residual Likelihood:		**Basis:**	
Residual Consequence:		**Basis:**	
Residual Risk Level:			**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely** / **Worst Case**	
Residual Schedule Impact:			
Impacted Scope of Work:			
Evaluation Comments:			
Event Comments: There will be no residual risk to the project as a BCP will be developed however, this risk could impact the LWDPP if realized. This risk should be reviewed as part of the LWDPP risk assessment activities.			

Risk / Opportunity Assessment Form

ID Number: 002 **Revision:** 03 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Interfaces with Other Facilities and Projects

Type: **Risk** External Technical | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PM - Project Manager | **Contact:** Jon Lunn | **Date Identified:** 12-Oct-06

Statement of Event: This project will interact with other facilities and projects during construction, startup testing and operation. Priorities conflict with other facilities and projects (e.g ARP process equipment is not ready when needed by the project). Due to conflicts, Project is delayed.

Likelihood:	Very Likely	**Basis:** Projects and facilities that interact with this project are subject to conflicting priorities
Consequence / Benefit:	Significant	**Basis:** Cost increases and schedule delays

Most Significant Cost Impact ($k): 100 | **Most Significant Schedule Impact:** 4 Wks

Level:	**High**	**Event Trigger:** This risk may occur after issuance of the first final design package and may remain as an operational vulnerability after turnover.
Handling Strategy:	Mitigate	**Description:** Keep H-Tank Farm Facility Project Owners & Managers informed about project needs/progress. Maintain integrated project schedule with appropriate logic ties between project & facility activities.

Handling Strategy Action Items:

002-1 Keep H-Tank Farm Facility Project Owners & Managers informed about project needs/progress., , , Jon Lunn,

002-3 Maintain integrated project schedule with appropriate logic ties between project & facility, , , Jon Lunn,

HS Implementation Cost ($K):	0	**Basis:** Development of an integrated detailed project schedule is within the baseline.
HS Implementation Schedule:	Ongoing	**Basis:** Development and maintenance of a detailed project schedule is an on-going task. for the life of the Project.

Other Handling Strategies:

Statement of Residual Risk: Unanticipated and/or changing priorities in HTF operations still occurs.

Residual Likelihood:	Likely	**Basis:** Unanticipated and/or changing priorities in HTF operations is not uncommon and can still occur.
Residual Consequence:	Marginal	**Basis:** Most likely case of working O/T to make up some impact to critical path, but being unable to mitigate 1 week delay.

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: Plan on O/T to make up some impact to critical path, but 2 weeks delay remains. Most L kely Case: Plan on O/T to make up some impact to critical path, but 1 week delay remains. Best Case: Priority changes occur but do not impact critical path
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	
	0	50	50	
Residual Schedule Impact:	0	1 Wk	2 Wks	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: Action item 2 deleted as the strategy for transfers to and from Tank 48 and 43 has been changed.

Risk / Opportunity Assessment Form

ID Number: 003 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Sampling and Analysis Turnaround Impacts Production

Type: **Risk** External Programmatic | **Category:** SRR

Assess. Element: 1.0 | **Title:** Processing

Responsible Org: SRR-ENG - Engineering | **Contact:** Steve Brown | **Date Identified:** 12-Oct-06

Statement of Event: Process samples must be analyzed during operation of FBSR. Rate of return of analytical results is slowed or additional samples are required. Timing and progress of sample results is delayed and production is impacted, since material can not be transferred making room for fresh feed.

Likelihood:	Likely	**Basis:** Parallel site (and LWD) projects may place competing demands on SRNL Analytical Staff. Key equipment is unique and seldom used. Potential for equipment failure or competing resource needs is high.
Consequence / Benefit:	Significant	**Basis:** Estimated delay due to sampling and analysis turnaround impacts. This however would occur during hot operations, therefore this risk is an operational vulnerability and does not impact this project.

Most Significant Cost Impact ($k): 200 | **Most Significant Schedule Impact:** 4 Wks

Level:	**Moderate**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Develop Sample & Analytical Plans well in advance of actual operations including a strategy where a sample of every transfer is not required, i.e. take weekly or monthly samples similar to what is done for the evaporator overheads. Ensure Lab back-up instrumentation is available in case of equipment failure. Develop a contingency plan if analytical results are not available, i.e. tighten the acceptable tolerance of the latest sample to verify results and to justify continued operation. This risk however would occur during hot operations, therefore it is an operational vulnerability and does not have any residual risk to the project.

Handling Strategy Action Items:

003-1 Develop Sample & Analytical Plans well in advance of actual operations including a strategy where a sample of every transfers is not required, i.e. take weekly or months samples similar to what is done for the evaporator overheads., , , Steve Brown,

003-2 Ensure back-up instrumentation is provided by operations in case of equipment failure., , , Steve Brown,

003-3 Evaluate F-Lab (772-F) and/or DWPF Lab capability to process FBSR samples., , , Steve Brown,

HS Implementation Cost ($K):	0	**Basis:** Cost of back-up instrumentation could be up to $500k. The use of F-Lab (772-F) to support the project, the cost of instrumentation, procedures, training etc, may be funded by other than this project.
HS Implementation Schedule:	0	**Basis:** No impact to project baseline schedule.

Other Handling Strategies:

Statement of Residual Risk: Estimated delay due to sampling and analysis turnaround impacts. This however would occur during hot operations, therefore this risk is an operational vulnerability and does not have any residual risk project.

Residual Likelihood:		**Basis:**		
Residual Consequence:		**Basis:**		
Residual Risk Level:				**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	
Residual Schedule Impact:				

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 004 **Revision:** 02 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Accessibility for Construction Work

Type: **Risk** Internal Programmatic | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: - | **Contact:** Mary Pallon | **Date Identified:** 16-Oct-06

Statement of Event: Construction work is required at or around Tank 48 and within Building 241-96H. Congestion / Collocation of work impacts accessibility to area on or around Tank 48/241-96H and/or Operations planned activities. Scheduled construction activities impacted.

Likelihood:	Very Likely	**Basis:** Tank 48 has one of the most congested tank tops at SRS. If not closely coordinated construction and operations activities will interfere with each other. 241-96H will be in operations as will the ARP Facility during installation of FBSR in the adjacent portion of the building.
Consequence / Benefit:	Significant	**Basis:** Additional cost and delay to schedule.

Most Significant Cost Impact ($k): 100 | **Most Significant Schedule Impact:** 4 Wks

Level:	**High**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Coordinate work with operations and other projects through participation in facility Work Window Lock-ins, 8 Week Lookaheads (T8s), and Plan of the Days (PODs). When activities are locked in, ensure critical resources (i.e. rigging, radcon, IH, etc.) are onboard and ready to support.

Handling Strategy Action Items:

004-1 Coordinate work with operations and other projects through participation in facility Work Window Lock-ins, 8 Week Lookaheads (T8s), and Plan of the Days (PODs)., , , Mary Pallon,

004-2 When activities are locked in, ensure critical resources (i.e. rigging, radcon, IH, etc.) are onboard and ready to support., , , Mary Pallon,

HS Implementation Cost ($K):	0	**Basis:** Can be performed without additional cost
HS Implementation Schedule:	0	**Basis:** Already part of ongoing scheduled activities

Other Handling Strategies:

Statement of Residual Risk: Some risk of accessibility problems still remains

Residual Likelihood:	Likely	**Basis:** The likelihood has been reduced by the RHS, but not eliminated.
Residual Consequence:	Significant	**Basis:** Minor delay and minimal additional cost to project

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: Delays and additional cost to project Most L kely Case: Minor delay and minimal additional cost to project Best Case: Minor inconvenience, but no schedule or cost impact
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 50	**Worst Case** 100	
Residual Schedule Impact:	0	2 Wks	4 Wks	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 007 **Revision:** 02 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: DOE Directed Changes to Technical Requirements			
Type: Risk External Technical	**Category:** DOE		
Assess. Element: 3.0	**Title:** General		
Responsible Org: SRR-PM - Project Manager	**Contact:** Jon Lunn	**Date Identified:** 16-Oct-06	
Statement of Event: Conceptual design begins with a given set of requirements. Requirements change or additional requirements are imposed. Scope increases.			
Likelihood:	Likely	**Basis:** Typically requirements are relatively stable, however they can change. Project 413.3A EVMS performance baselines will not be established until after Preliminary Design.	
Consequence / Benefit:	Crisis	**Basis:** Change in Tech baseline would likely result in cost and schedule baseline impact.	
Most Significant Cost Impact ($k): 5,000		**Most Significant Schedule Impact:** 6 Mths	
Level:	**High**	**Event Trigger:** Currently open; Close upon DOE acceptance of Final Design.	
Handling Strategy:	Accept	**Description:** Changes to the Technical baseline imposed by DOE would be a change in project scope and a BCP would be generated to move funding from DOE contingency.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):		**Basis:**	
HS Implementation Schedule:		**Basis:**	
Other Handling Strategies:			
Statement of Residual Risk: A risk remains that DOE may impose additional technical requirements on the FBSR design.			
Residual Likelihood:	Very Unlikely	**Basis:** Typically requirements are relatively stable, however they can change. Project baselines will not be established until after Preliminary Design.	
Residual Consequence:	Crisis	**Basis:** Cost and schedule impact due to modified technical requirements.	
Residual Risk Level:	**High**		**Residual Impact Basis:** Worst Case: Cost and schedule impact due to modified technical requirements Most Lkely Case: Cost and schedule impact due to modified technical requirements Best Case: Cost and schedule impact due to modified technical requirements
Residual Cost Impact ($K):	**Best Case** 500	**Most Likely** 1,000	**Worst Case** 5,000
Residual Schedule Impact:	0	6 Wks	6 Mths
Impacted Scope of Work:			
Evaluation Comments:			
Event Comments: Assess risks associated with execution of 413-3B when information becomes available.			

Risk / Opportunity Assessment Form

ID Number: 008 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Availability of Construction Equipment			
Type: **Risk** External Programmatic	**Category:** SRR		
Assess. Element: 3.0	**Title:** General		
Responsible Org: -	**Contact:** Mary Pallon	**Date Identified:** 16-Oct-06	
Statement of Event: It is assumed that a specialized crane can be obtained, with qualified personnel. Crane is not available when required. Project Delays.			
Likelihood:	Unl kely	**Basis:** This project is a high profile, accelerated project, which should increase priority for access to equipment. A crane can currently be made available on-site and has been requested for the required window.	
Consequence / Benefit:	Significant	**Basis:** The designated crane gets reassigned or has mechnaical issues and another crane must be located for Tank 48 use.	
Most Significant Cost Impact ($k): 100		**Most Significant Schedule Impact:** 1 Mth	
Level:	**Moderate**	**Event Trigger:**	
Handling Strategy:	Accept	**Description:** This risk is accepted based on priority being requested for on-site crane. Although priority for crane usage is requested, a higher priority could still "bump" this project.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):		**Basis:**	
HS Implementation Schedule:		**Basis:**	
Other Handling Strategies:			
Statement of Residual Risk: Crane may still be unavailable			
Residual Likelihood:	Unl kely	**Basis:** Likelihood remains unchanged	
Residual Consequence:	Significant	**Basis:** Delay while waiting for equipment	
Residual Risk Level:	**Moderate**		**Residual Impact Basis:** Worst Case: Another crane must be located for Tank 48 use. Most L kely Case: Delay while waiting for equipment Best Case: Project can reschedule without impact of overall delay
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 100
Residual Schedule Impact:	0	1 Wk	1 Mth
Impacted Scope of Work:			
Evaluation Comments:			
Event Comments:			

Risk / Opportunity Assessment Form

ID Number: 009 **Revision:** 02 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Readiness/ORR Assessment Findings			
Type: **Risk** Internal Technical	**Category:** SRR		
Assess. Element: 3.0	**Title:** General		
Responsible Org: SRR-PO - Project Owner	**Contact:** John Contardi	**Date Identified:** 16-Oct-06	
Statement of Event: Process has to be proved ready to operate. Process is found to be not ready by Readiness Assessment. Project is delayed while concerns are resolved.			
Likelihood:	Unl kely	**Basis:** Significant facility and system design and operating issues are very likely to be identified and resolved at earlier stages of the project and are unl kely to arise during the Operational Readiness Review (ORR). Therefore additional design, procurement, and construction activities will not be required. ORR reviewers are independent of the Project Team and may not agree with resolutions and may identify additional issues not previously evaluated.	
Consequence / Benefit:	Significant	**Basis:** Cost of design rework to resolve finding and schedule impact. At this advance stage of the project no major rework will be required, however limited rework could be necessary if this risk were realized.	
Most Significant Cost Impact ($k): 100		**Most Significant Schedule Impact:** 2 Mths	
Level:	**Moderate**	**Event Trigger:** Open upon Start of Readiness Assessment; Close upon completion of ORR.	
Handling Strategy:	Mitigate	**Description:** Project Team develop and perform detailed management checklist prior to beginning RA. Continued engagement of DOE, Operations and Safety organizations in the system design reviews and testing activities. DOE Operations and Safety organizations to participate in test activities conducted before the DOE ORR. Engage the DOE ORR Team prior to the SAT to enable the team to become familiar with the systems and operations.	
Handling Strategy Action Items: 009-1 Project Team develop and perform detailed management checklist prior to beginning RA. Continued engagement of DOE, , , John Contardi, 009-2 Engage the DOE ORR Team prior to the SAT to enable the team to become familiar with the systems, , , John Contardi, 009-3 Continued engagement of DOE, Operations and Safety organizations in the system design reviews and testing activities., , , John Contardi, 009-4 DOE Operations and Safety organizations to participate in test activities conducted before the DOE ORR, , , John Contardi,			
HS Implementation Cost ($K):	50	**Basis:** Cost of management checklist activities	
HS Implementation Schedule:	0	**Basis:** This could be performed in parallel with ongoing startup activities as functional areas become available for assessment.	
Other Handling Strategies:			
Statement of Residual Risk: Findings may still occur, but any potential for major findings will have been avoided			
Residual Likelihood:	Very Unlikely	**Basis:** Working closely with DOE reduces the l kelihood of having unexpected ORR findings.	
Residual Consequence:	Significant	**Basis:** Cost of minor finding resolution and schedule delay.	
Residual Risk Level:	**Low**		**Residual Impact Basis:** Worst Case: Cost of finding resolution and schedule delay Most L kely Case: Cost of minor finding resolution and schedule delay Best Case: Finding does not impact schedule in its resolution
Residual Cost Impact ($K):	**Best Case** 10	**Most Likely** 25	**Worst Case** 50
Residual Schedule Impact:	0	2 Wks	1 Mth
Impacted Scope of Work:			
Evaluation Comments:			

Risk / Opportunity Assessment Form

ID Number: 009 **Revision:** 02 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 011 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Unsafe Conditions Discovered at Turnover

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PM - Project Manager | **Contact:** Jon Lunn | **Date Identified:** 16-Oct-06

Statement of Event: Process requires a Final Acceptance Inspection (Manual 8Q, Procedure 51) before start up. Unsafe conditions are discovered during wa k down. Delay while remedial action is taken.

Likelihood:	Unl kely	**Basis:** This is a new process for SRS
Consequence / Benefit:	Significant	**Basis:** Cost of minor design changes and schedule delay.

Most Significant Cost Impact ($k): 150 | **Most Significant Schedule Impact:** 1 Mth

Level:	**Moderate**	**Event Trigger:** Risk may be realized during Final Acceptance Inspection (Manual 8Q, Procedure 51), after successful acceptance/closure of FAI risk can no longer occur.
Handling Strategy:	Mitigate	**Description:** Operations, Safety, Engineering, Industrial Hygiene, Construction, QA and Maintenance to participate in design reviews and monthly walkdowns.

Handling Strategy Action Items:

011-1 Arrange for Operations, Safety, Engineering, Industrial Hygiene, Construction and Maintenance to particpate in design reviews., , , Steve Hall,

011-2 Arrange for Operations, Safety, Engineering, Industrial Hygiene, Construction and Maintenance to particpate in monthly walkdowns., , , Mary Pallon,

HS Implementation Cost ($K):	0	**Basis:** Design reviews are already included in the project baseline
HS Implementation Schedule:	0	**Basis:** Will be conducted along with already scheduled project activities

Other Handling Strategies:

Statement of Residual Risk: Some SMI-51 concerns may still arise

Residual Likelihood:	Unl kely	**Basis:** Likelihood is reduced by involving SMI-51 walkdown team in design reviews and wekly safety walkdowns.
Residual Consequence:	Significant	**Basis:** Cost of additional design and schedule impact

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: Cost of additional design and schedule impact Most L kely Case: Cost of additional design and schedule impact Best Case: No additional cost or schedule impact
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 75	**Worst Case** 100	
Residual Schedule Impact:	0	2 Wks	3 Wks	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 012 **Revision:** 02 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Stakeholder Participation

Type: **Risk** External Programmatic | **Category:** DOE

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PO - Project Owner | **Contact:** John Contardi | **Date Identified:** 16-Oct-06

Statement of Event: Project will fall under the scrutiny of various stakeholders. Stakeholders (DNFSB, DOE, Regulatory, etc.) do not accept R&D results. Project will be delayed while resolving stakeholder concerns.

Likelihood:	Likely	**Basis:** Stakeholders are eager to offer their input.
Consequence / Benefit:	Significant	**Basis:** Additional design, studies etc., will be required causing schedule delays and additional cost to project.

Most Significant Cost Impact ($k): 1500 | **Most Significant Schedule Impact:** 2 Mths

Level:	**Moderate**	**Event Trigger:** Currently open; Close upon successful completion of ORR.
Handling Strategy:	Mitigate	**Description:** Develop communication plan for involving stakeholders. Keep Stakeholders/Senior Management informed of R&D results. If stakeholders do impose additional design/operational /research/testing requirements on the project a BCP will be developed to obtain additional funding from DOE contingency. As an ongoing part of project execution the Integrated Project Team will be utilized to communicate information to Senior Management and determine actions for additional stakeholder needs as they develop.

Handling Strategy Action Items:

012-2 Prepare and issue Final Technology Report on R&D results to stakeholders., , , Chris Johnson,

HS Implementation Cost ($K):	0	**Basis:** This will not add additional cost to the project
HS Implementation Schedule:	0	**Basis:** Is part of ongoing activities

Other Handling Strategies:

Statement of Residual Risk: If this risk is realized, a BCP will be developed to obtain additional funding from DOE contingency.

Residual Likelihood:	Unl kely	**Basis:** Likelihood has been reduced by good communication and involvement with stakeholders.
Residual Consequence:	Significant	**Basis:** Additional design, studies etc., will be required causing schedule delays and additional cost to project.

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: Additional design, studies etc., will be required causing schedule delays and additional cost to project. Most Likely Case: Some additional design, studies etc., will be required causing schedule delays and additional cost to project. Best Case: Minimal additional design, studies etc., will be required causing additional cost to project only.
Residual Cost Impact ($K):	**Best Case** 500	**Most Likely** 1000	**Worst Case** 1500	
Residual Schedule Impact:	0	1 Mth	2 Mth	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: If this risk is realized, a BCP will be developed to obtain additional funding from DOE contingency.

Risk / Opportunity Assessment Form

ID Number: 013 **Revision:** 02 **Last Date Evaluated:** 11-Oct-10 **Status:** Active

Event Title: Safety Basis not Accepted By DOE

Type: **Risk** External Technical | **Category:** SRR

Assess. Element: 4.0 | **Title:** Safety In Design

Responsible Org: SRR-DA - Design Authority | **Contact:** Chris Johnson | **Date Identified:** 16-Oct-06

Statement of Event: TTP Safety Basis is required to be approved by DOE for implementation. DOE does not accept the Safety Basis. The Safety Basis will have to be modified or redone to DOE's acceptance requirements.

Likelihood:	Very Unlikely	**Basis:** The Tank 48 team maintains communication with DOE to ensure they are involved in the key decisions regarding the Safety Basis. Obtaining concurrence throughout each phase of the project makes this a very unl kely risk.
Consequence / Benefit:	Crisis	**Basis:** Rework of the DSA and possible changes in Control Stategies.

Most Significant Cost Impact ($k): 5,000 | **Most Significant Schedule Impact:** 1 Yr

Level:	**High**	**Event Trigger:** Requesting DOE approval
Handling Strategy:	Mitigate	**Description:** Ensure DOE involvement during development of the Safety Design Strategy (SDS) to avoid last minute surprises. DOE will participate in the CHA meetings, SIRCs and Safety Design Integration Team meetings. SRR will obtain DOE approval of interim documents such as the SDS, Conceptual Safety Design Report, Preliminary Safety Design Report and Preliminary Documented Safety Analysis. DOE has established a Technical Authority Board to review these interim documents.

Handling Strategy Action Items:

013-4 Obtain DOE approval of interim Safety Basis documents including CSDR, PSDR, and PDSA., , , Steve Hall,

HS Implementation Cost ($K):	0	**Basis:** These activities can be accomplished in this manner without additional cost.
HS Implementation Schedule:	0	**Basis:** These activities are included in the Project Baseline Schedule.

Other Handling Strategies:

Statement of Residual Risk: Risk of DSA strategy changes still remains

Residual Likelihood:	Very Unlikely	**Basis:** Likelihood reduced but not to non-credible
Residual Consequence:	Significant	**Basis:** Modification of the DSA and minor changes in Control Strategies.

Residual Risk Level:	**Low**			**Residual Impact Basis:** Worst Case: Rework of the DSA and changes in Control Strategies. Most L kely Case: Modification of the DSA and minor changes in Control Strategies. Best Case: Modification of the DSA.
Residual Cost Impact ($K):	**Best Case** 20	**Most Likely** 250	**Worst Case** 1,000	
Residual Schedule Impact:	0	2 Wks	2 Mths	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 014 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Resources Not Available

Type: **Risk** Internal Programmatic | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PM - Project Manager | **Contact:** Jon Lunn | **Date Identified:** 16-Oct-06

Statement of Event: Resources are required for the implementation of TTP Project activities. These resources include Engineering, Construction, Operations, Maintenance, vendor staffing, etc. Planned resources are not available when required. Activities cannot be completed as scheduled.

Likelihood:	Likely	**Basis:** Experience with construction and start-up activities in other site organizations indicates that resource issues and limitations are l kely to be encountered during the TTP Project.
Consequence / Benefit:	Significant	**Basis:** Delay to project and additional cost to secure resources at a premium.

Most Significant Cost Impact ($k): 200 | **Most Significant Schedule Impact:** 8 Wks

Level:	**Moderate**	**Event Trigger:** Currently open; Close upon completion of Project.
Handling Strategy:	Mitigate	**Description:** Establish project baselines and key contract milestones. Maintain timely funding authorizations and accurate resource forecasts for all support management organizations.

Handling Strategy Action Items:

014-1 Establish project baselines and key contract milestones, , , Jon Lunn,

HS Implementation Cost ($K):	0	**Basis:** Included within the planned Project Controls project management with no additional cost to the project.
HS Implementation Schedule:	Ongoing	**Basis:** Baseline and forecasting is an on-going process for the life of the Project.

Other Handling Strategies:

Statement of Residual Risk: Planned resources could still not be available when required. Activities could not be completed as scheduled.

Residual Likelihood:	Unl kely	**Basis:** The additional Project Controls reduce the likelihood of this event.
Residual Consequence:	Significant	**Basis:** Most L kely Case: Project is somewhat impacted by resource limitations

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: Project is impacted by resource limitations Most L kely Case: Project is somewhat impacted by resource limitations Best Case: Project not impacted by resource limitations as work-arounds can be found
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 100	**Worst Case** 200	
Residual Schedule Impact:	0	4 Wks	8 Wks	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: Reference TTT Risk # FBSR 20.

Risk / Opportunity Assessment Form

ID Number: 016 **Revision:** 03 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Implementation of DNFSB Recommendation 2004-2 Required			
Type: **Risk** External Technical	**Category:** DOE		
Assess. Element: 4.0	**Title:** Safety In Design		
Responsible Org: SRR-DA - Design Authority	**Contact:** Steve Hall	**Date Identified:** 16-Oct-06	
Statement of Event: FBSR is a Haz Cat 2 Facility with an active ventilation system classified as PS. This design strategy is outlined within letter SRR-DPM-2010-00007. A risk exists that DNFSB provide further guidance on the implementation of DNFSB 2004-2, resulting in DOE directing the FBSR Team to provide an active confinement system functionally classified as Safety Significant.			
Likelihood:	Unl kely	**Basis:** DOE has accepted the strategy as described in SRR-DPM-2010-00007.	
Consequence / Benefit:	Crisis	**Basis:** Implementation of functionally (NPH) classified active confinement system for FBSR will require a major design change. An impact to cost and to the TTP Project schedule will be incurred.	
Most Significant Cost Impact ($k): 25,000		**Most Significant Schedule Impact:** 6 Mths	
Level:	**High**	**Event Trigger:** Currently open; Close after Final Design has been approved by DOE.	
Handling Strategy:	Accept	**Description:** The TTP Project Design strategy complies with current DOE orders and site procedures. There are no additional handling strategies that can be applied.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):		**Basis:**	
HS Implementation Schedule:		**Basis:**	
Other Handling Strategies:			
Statement of Residual Risk: A risk remains that DNFSB provide further guidance on the implementation of DNFSB 2004-2, resulting in DOE directing the FBSR Team to provide an active confinement system functionally classified as Safety Significant. If this risk is realized, a BCP will be developed to obtain additional funding from DOE contingency.			
Residual Likelihood:	Unl kely	**Basis:** DOE has accepted the strategy as described in SRR-DPM-2010-00007.	
Residual Consequence:	Crisis	**Basis:** Implementation of functionally (NPH) classified active confinement system for FBSR will require a major design change. An impact to cost and to the TTP Project schedule will be incurred.	
Residual Risk Level:	**High**		**Residual Impact Basis:** Worst Case: A Functionally SS active confinement system is required (e.g. NPH). Most L kely Case: Some modifications are required e.g., DCS to hardware change. Best Case: Minor modifications are required.
Residual Cost Impact ($K):	**Best Case** 500	**Most Likely** 1,000	**Worst Case** 25,000
Residual Schedule Impact:	1 Mth	2 Mths	6 Mths
Impacted Scope of Work:			
Evaluation Comments:			
Event Comments: If this risk is realized, a BCP will be developed to obtain additional funding from DOE contingency.			

Risk / Opportunity Assessment Form

ID Number: 019 **Revision:** 02 **Last Date Evaluated:** 11-Oct-10 **Status:** Active

Event Title: Addition of the GAC to Design

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 4.0 | **Title:** Safety In Design

Responsible Org: SRR-ENG - Engineering | **Contact:** Steve Brown | **Date Identified:** 16-Oct-06

Statement of Event: Currently it is assumed that a GAC (granulated activated carbon) bed will be not be required in the off-gas stream from FBSR to comply with SCDHEC Standard 8 for Mergury (HG) emission. A risk exists that an off-gas characterization could be developed that does require a GAC bed. A GAC bed will then be added to the design.

Likelihood:	Very Unlikely	**Basis:** Based on 2006 Hazen ESTD teast results, a preliminary evaluation (WSRC-TR-2007-00082) indicates that a GAC bed will not be required to comply with SCDHEC Standard 8 for Hg emission in FBSR off-gas.
Consequence / Benefit:	Crisis	**Basis:** Need to install and maintain a GAC Bed System. Cost of design (including SS controls, PDSA rework etc.). Schedule delay to implement.

Most Significant Cost Impact ($k): 500 | **Most Significant Schedule Impact:** 6 Mths

Level:	**High**	**Event Trigger:** During preliminary design off-gas characterization determines need for GAC bed, or SCDHEC refuse permit.
Handling Strategy:	Mitigate	**Description:** Complete analysis of Hazen test data and flowsheet development and work with environmental to determine that the GAC bed indeed is not required in sufficient time to minimize schedule impact.

Handling Strategy Action Items:

019-2 Complete off-gas characterization during preliminary design phase., , , Steve Brown,

019-3 Complete GAC bed evaluation for the production unit to comply with SCDHEC permitting requirements., , , Rm Campbell,

019-4 Obtain SCDHEC approval for Construction Permit., , , Rm Campbell,

HS Implementation Cost ($K):	0	**Basis:** No additional cost is associated with aceleration of flowsheet development and environmental calculations.
HS Implementation Schedule:	0	**Basis:** No impact to schedule baseline.

Other Handling Strategies:

Statement of Residual Risk: A risk remains that a GAC bed is required.

Residual Likelihood:	Very Unlikely	**Basis:** Likelihood of requiring a GAC bed has not been reduced.
Residual Consequence:	Critical	**Basis:** Schedule impact has been reduced should a GAC bed be required.

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: A GAC bed is required and 3 mths duration of design and procurement Most L kely Case: A GAC bed is required and 2 mths duration of design and procurement Best Case: A GAC bed is required and 2 mths duration of design and procurement
Residual Cost Impact ($K):	**Best Case** 500	**Most Likely** 500	**Worst Case** 500	
Residual Schedule Impact:	2 Mths	2 Mths	3 Mths	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 020 **Revision:** 02 **Last Date Evaluated:** 11-Oct-10 **Status:** Active

Event Title: Analysis of 241-96H Structure Shows Not-Qualified for II/I Concerns			
Type: **Risk** Internal Technical	**Category:** SRR		
Assess. Element: 4.0	**Title:** Safety In Design		
Responsible Org: SRR-DS - Design Services	**Contact:** Sergio Mazul	**Date Identified:** 16-Oct-06	
Statement of Event: It is assumed that Building 241-96H will be qualified as a II/I designed structure. Analysis determines that Building 241-96H is not qualified. Project cannot use Building 241-96H without modification.			
Likelihood:	Unl kely	**Basis:** The existing structure was not designed for PC-3 loads but has been analyzed with current loads to meet II/I criteria.	
Consequence / Benefit:	Crisis	**Basis:** Project cannot use Building 241-96H without modification	
Most Significant Cost Impact ($k): 750		**Most Significant Schedule Impact:** 6 Mths	
Level:	**High**	**Event Trigger:**	
Handling Strategy:	Avoid	**Description:** Perform the II/I Analysis during preliminary design to identify impacts prior to baselining the project. Design project to II/I criteria.	
Handling Strategy Action Items: 020-1 Perform the II/I Analysis during preliminary design to identify impacts prior to baselining the project (complete), , , Sergio Mazul, 020-2 Perform project design to satisfy II/I criteria., , , Sergio Mazul,			
HS Implementation Cost ($K):	0	**Basis:** The analysis is already part of the project baseline	
HS Implementation Schedule:	0	**Basis:** Will be included schedule baseline with earlier start date.	
Other Handling Strategies:			
Statement of Residual Risk: By designing to II/I criteria, this risk has been avoided.			
Residual Likelihood:		**Basis:**	
Residual Consequence:		**Basis:**	
Residual Risk Level:			**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely** / **Worst Case**	
Residual Schedule Impact:			
Impacted Scope of Work:			
Evaluation Comments:			
Event Comments:			

Risk / Opportunity Assessment Form

ID Number: 022 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Interfaces With New Contractor Impacts Project

Type: **Risk** External Programmatic | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PM - Project Manager | **Contact:** Jon Lunn | **Date Identified:** 16-Oct-06

Statement of Event: The TTP Project will have a subcontractor that has not been used at SRS. Design and contractural requirements with a new subcontractor results in delays or changes in assumed equipment interfaces. Schedule delay and rework costs.

Likelihood:	Unl kely	**Basis:** The FBSR contract has been awarded and magnitude and details of the equipment interfaces are being resolved.
Consequence / Benefit:	Crisis	**Basis:** Delay to project. Additional costs involved with resolution of facility interfaces and preliminary design. (above those assumed in the estimate)

Most Significant Cost Impact ($k): 2,000 | **Most Significant Schedule Impact:** 9 Mths

Level:	**High**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Ensure early involvement of subcontractor in preliminary design. Expedite preliminary design.

Handling Strategy Action Items:

022-4 Assign resident personnel with TTT during the design and fabrication effort. (complete), , , Jon Lunn,

022-5 Identify critical interfaces within the baseline schedule. (complete), , , Jon Lunn,

HS Implementation Cost ($K):	0	**Basis:** Within the Project baseline.
HS Implementation Schedule:	0	**Basis:** No impact to Projectbaseline schedule.

Other Handling Strategies:

Statement of Residual Risk: Even with early subcontractor involvement some problems may occur.

Residual Likelihood:	Very Unlikely	**Basis:** Likelihood is reduced by early involvement of subcontractor.
Residual Consequence:	Crisis	**Basis:** Additional cost and schedule impact to resolve minor issues with facility interfaces

Residual Risk Level:	**High**			**Residual Impact Basis:** Worst Case: Additional cost and schedule impact to resolve issues with facility interfaces Most L kely Case: Additional cost and schedule impact to resolve minor issues with facility interfaces Best Case: Issues arise with facility interfaces but no additional cost or schedule impact.
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 250	**Worst Case** 1000	
Residual Schedule Impact:	0	4 Mths	6 Mths	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: Reference TTT Risk FBSR 18.

Risk / Opportunity Assessment Form

ID Number: 023 **Revision:** 04 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Design Assumptions and Design Uncertainties Result In Rework

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 4.0 | **Title:** Safety In Design

Responsible Org: SRR-DS - Design Services | **Contact:** Sergio Mazul | **Date Identified:** 16-Oct-06

Statement of Event: Assumptions are made at the Preliminary Design Stage. One or more of these assumptions are determined to be incorrect. Design must be changed to resolve discrepancy.

Examples of these assumptions include:

- It is assumed that a new electrical substation will not be required.
- The existing stack at 241-96H will be sufficient to protect personnel from gases released during the FBSR process.
- The FBSR Process will be monitored and controlled from the 3H Control Room (Building 241-2H) via the existing Liquid Waste Control Network (LWCN) Distributed Control System (DCS). The LWCN DCS has adequate capacity to handle the additional controller and I/O (600) associated with the FBSR Process.
- Existing stack material of construction is compatible with the FBSR process.
- The existing PI System has adequate capacity for storage of FBSR process data.

Likelihood:	Unl kely	**Basis:** This design is new to SRS and assumptions have been made during conceptual design, that if proven incorrect may result in major re-design.
Consequence / Benefit:	Crisis	**Basis:** Significant rework will be required.

Most Significant Cost Impact ($k): 3,000 | **Most Significant Schedule Impact:** 6 Mths

Level:	**High**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Determine the need for new electrical substation. Develop and issue a viable automation and controls strategy. Evaluate off-gas composition and potential personnel exposure.

Handling Strategy Action Items:

023-3 Develop and issue a viable automation and controls strategy for the FBSR Project., , , Sergio Mazul,
023-4 Perform electrical load study and obtain PSUPS Part A approval., , , Sergio Mazul,
023-5 Perform a study to determine if inside of the stack requires the application of an additonal protective coating., , , Sergio Mazul,
023-6 Evaluate off-gas composition for plume effects and confirm worker protection controls are required., , , Don McWhorter,

HS Implementation Cost ($K):	0	**Basis:** No additional cost to project
HS Implementation Schedule:	0	**Basis:** Within project baseline schedule

Other Handling Strategies:

Statement of Residual Risk: The risk of encountering space problems within 241-96H can be avoided with the handling strategy. The worst case residual risk would be a ventilation system upgrade.

Residual Likelihood:	Unl kely	**Basis:** Likelihood of design assumptions being incorrect remains the same.
Residual Consequence:	Critical	**Basis:** Most L kely Case: Some assumptions are partially incorrect requiring some re-design.

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: Additional modifications are required. Most L kely Case: Some assumptions are partially incorrect requiring some re-design Best Case: Any incorrect assumptions can be accomodated for in design, however schedule delay is not avoided.
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 500	**Worst Case** 1500	
Residual Schedule Impact:	2 Mths	2 Mths	3 Mths	

Impacted Scope of Work:

Risk / Opportunity Assessment Form

ID Number: 023 **Revision:** 04 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Evaluation Comments:

Event Comments: For design assumptions of space availability see Risk 061.

Risk / Opportunity Assessment Form

ID Number: 024 **Revision:** 02 **Last Date Evaluated:** 11-Oct-10 **Status:** Active

Event Title: Insufficient Maintainability Provided

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 4.0 | **Title:** Safety In Design

Responsible Org: SRR-DS - Design Services | **Contact:** Sergio Mazul | **Date Identified:** 16-Oct-06

Statement of Event: Design changes are required after the RDSR identifies maintainability issues.

Likelihood:	Likely	**Basis:** First of a kind system at SRS and therefore maintainability is an unknown
Consequence / Benefit:	Critical	**Basis:** Design changes to the FBSR skid due to maintainability issues. Cost and schedule impact.

Most Significant Cost Impact ($k): 500 | **Most Significant Schedule Impact:** 3 Mths

Level:	**High**	**Event Trigger:** RDSR is issued.
Handling Strategy:	Mitigate	**Description:** Have Maintenance, Ops and Rad Con involved in the design to ID and resolve issues during the design of the skid.

Handling Strategy Action Items:

024-1 Have Maintance, Ops and Rad Con involved in the design to ID and resolve issues during the design of the skid., , , Sergio Mazul,
024-2 Perform RDSR early., , , Ken Fleming,
024-3 Develop a maintenance strategy during preliminary design., , , Sergio Mazul,
024-4 Use MCU lessons learned in developing maintenance strategies/design., , , Sergio Mazul,
024-5 Complete RAMI study., , , Sergio Mazul,

HS Implementation Cost ($K):	0	**Basis:** Within baseline.
HS Implementation Schedule:	0	**Basis:** Can be performed in parallel with already scheduled design reviews

Other Handling Strategies:

Statement of Residual Risk: A design change may still be required to provide the required maintainability

Residual Likelihood:	Unl kely	**Basis:** Likelihood has decreased based on employing additional design reviews.
Residual Consequence:	Significant	**Basis:** Any minor change will cost dollars and schedule.

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: Design modification. Cost and schedule impact. Most L kely Case: Small design modification. Cost and schedule impact. Best Case: Minor design modification. Cost and schedule impact.
Residual Cost Impact ($K):	**Best Case** 10	**Most Likely** 50	**Worst Case** 100	
Residual Schedule Impact:	1 Wk	2 Wks	1 Mth	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: See Risk 085 for remote tooling risks.

Risk / Opportunity Assessment Form

ID Number: 027 **Revision:** 02 **Last Date Evaluated:** 11-Oct-10 **Status:** Active

Event Title: Availability of Consumables

Type: **Risk** External Programmatic | **Category:** SRR

Assess. Element: 2.2 | **Title:** Support Systems

Responsible Org: SRR-DA - Design Authority | **Contact:** Steve Hall | **Date Identified:** 16-Oct-06

Statement of Event: Consumables are scheduled to be delivered to support testing, startup and operations. Delivery of consumables is held up (i.e. More than 1 week delay). Testing, startup and operation cannot continue without consumables.

Likelihood:	Likely	**Basis:** Access to consumables, such as fuses, lamps, incidentals, and raw material (i.e., chemical, etc.), are contengent upon expected life of the components, expenditure of materials, stores availability and storage capabilities, as well as availabiltiy and delivery methods of suppliers. Historically, a four to eight week turn around on common raw material procurement and delivery is not unusual.
Consequence / Benefit:	Significant	**Basis:** Delay in material receipts of greater than one week will result in potential prolonged outages and reduced production.

Most Significant Cost Impact ($k): 0 | **Most Significant Schedule Impact:** 8 Wks

Level:	**Moderate**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Perform identification of critical spares/resources. Set up parts in stores. Where practical, consumables critical to this project and with lead times greater than one week shall be set up in site stores.

Handling Strategy Action Items:

027-1 Where practical, consumables critical to this project and with lead times greater than one week shall be set up in site stores or purchased in advance., , , Steve Hall,

027-2 Identify primary and secondary suppliers/vendors of unique consumables which can not be maintained in site stores., , , Steve Hall,

027-3 Ensure/validate delivery system can meet needs., , , Steve Hall,

HS Implementation Cost ($K):	50	**Basis:** 40 hours design authority engineering to research and identify. 40 hours procurement to set up in FMTS. 20 hour QA to validate. Capital cost of initial consumables resourcing.
HS Implementation Schedule:	2.5	**Basis:** Two week and 20 hours running concurence to design closure. Activities should not extend end dates. 40 engineering hours. 40 exempt procurement hours. 20 QA Exempt hours.

Other Handling Strategies:

Statement of Residual Risk: With critical parts and spares on hand, the remaining risk is limited to major comsumables suchas chemicals and cold feeds.

Residual Likelihood:	Unl kely	**Basis:** The likelihood has been reduced by the identification and procurement of additional consumables that can be kept on hand.
Residual Consequence:	Negligible	**Basis:** Process chemicals are delayed one week.

Residual Risk Level:	**Low**			**Residual Impact Basis:** Worst Case: Process chemicals are delayed one week. Most L kely Case: Process chemicals are delayed one week. Best Case: Process chemicals are delayed one week.
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact:	1 Wk	1 Wk	1 Wk	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 028 **Revision:** 03 **Last Date Evaluated:** 11-Oct-10 **Status:** Active

Event Title: Waste Feed Nozzle Deposits			
Type: Risk Internal Technical	**Category:** SRR		
Assess. Element: 1.2.1	**Title:** Feed System		
Responsible Org: SRR-ENG - Engineering	**Contact:** Steve Brown	**Date Identified:** 23-Oct-06	
Statement of Event: Currently it is assumed that: feed nozzle design is acceptable; nozzle clearing methods, (flush with water or acid) demonstrated during testing, are effective. During operations, deposits form on the waste feed nozzle to the DMR and the nozzle clogs interrupting/delaying operations. Processing cannot be completed until problem is resolved.			
Likelihood:	Likely	**Basis:** Tank 48 simulant feed did clog the nozzles during Hazen testing	
Consequence / Benefit:	N/A	**Basis:** This will not impact the project during testing and startup, but would be an operational vulnerability.	
Most Significant Cost Impact ($k): N/A		**Most Significant Schedule Impact:** N/A	
Level:		**Event Trigger:**	
Handling Strategy:	Mitigate	**Description:** Perform ESTD testing with Tank 48 simulant. Engineering Scaled Testing Lessons Learned will be incorporated into clean in place design. Inspect DMR feed nozzle for deposits after ESTD testing. This risk is an operational vulnerability.	
Handling Strategy Action Items: 028-2 Incorporate Engineering Scaled Testing Lessons Learned into clean in place design., , , Sergio Mazul, 028-8 Review Hazen test results and evaluate the need for more robust clean in place system., , , Steve Brown,			
HS Implementation Cost ($K):	0	**Basis:** Testing is within the current cost baseline.	
HS Implementation Schedule:	0	**Basis:** Testing is included in the current schedule.	
Other Handling Strategies:			
Statement of Residual Risk: This risk, if realized would be an operational vulnerability.			
Residual Likelihood:		**Basis:**	
Residual Consequence:		**Basis:**	
Residual Risk Level:			**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely** / **Worst Case**	
Residual Schedule Impact:			
Impacted Scope of Work:			
Evaluation Comments:			
Event Comments:			

Risk / Opportunity Assessment Form

ID Number: 029 **Revision:** 02 **Last Date Evaluated:** 11-Oct-10 **Status:** Active

Event Title: Scale-up of FBSR Process Encounters Problems

Type: Risk Internal Technical | **Category:** SRR

Assess. Element: 1.0 | **Title:** Processing

Responsible Org: SRR-ENG - Engineering | **Contact:** Steve Brown | **Date Identified:** 23-Oct-06

Statement of Event: Scale-up of the steam reforming process to treat Tank 48 could result in lower throughputs than planned in the design.

Likelihood:	Unl kely	**Basis:** The scale-up capacity from the Hazen unit to other designs has been performed in the past and is likely to be well understood.
Consequence / Benefit:	N/A	**Basis:** Delay in schedule for Tank 48 return to service. This is an impact to the System Plan execution, however is not an impact to the project.

Most Significant Cost Impact ($k): N/A | **Most Significant Schedule Impact:** N/A

Level:		**Event Trigger:**
Handling Strategy:	Avoid	**Description:** The Hazen tests will validate design flow rates of Tank 48 simulate feed. Expected flow rate will be based on a smaller 15" DMR bed unit. The design for the Tank 48 unit will be approximately 26" bed DMR. The inability of the scaled-up FBSR to meet throughput requirements is not considered a risk to the project, however this is an issue that will impact the LLWDSP. Use the Hazen test results to validate design flow rates of Tank 48 simulate feed; perform elutriation and material & energy balance calculations; and perform computational fluid dynamics (CFD) modeling.

Handling Strategy Action Items:

029-1 Use the Hazen test results to validate design flow rates of Tank 48 simulated feed., , , Steve Brown,
029-2 Perform elutriation and material & energy balance calculations., , , Steve Brown,
029-3 Perform computational fluid dynamics (CFD) modeling., , , Sergio Mazul,

HS Implementation Cost ($K):	0	**Basis:** No additional cost to project
HS Implementation Schedule:	0	**Basis:** Will be accomodated in existing scheduled tests

Other Handling Strategies:

Statement of Residual Risk: The throughput of the FBSR may still be impacted by scaleup issues. The inability of the scaled-up FBSR to meet throughput requirements is is not considered a risk to the project, however this is an issue that will impact the LWDPP.

Residual Likelihood:		**Basis:**		
Residual Consequence:		**Basis:**		
Residual Risk Level:				**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact:	0	0	0	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: The inability of the scaled-up FBSR to meet throughput requirements is not considered a risk to the project, however this is an issue that will impact the System Plan. This issue should be evaluated by the planning group for impact to the System Plan. (Reference PBS-0014, Risk- 122)

Risk / Opportunity Assessment Form

ID Number: 033 **Revision:** 02 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Long Lead Procurement is Denied or Delayed

Type: **Risk** External Programmatic | **Category:** DOE

Assess. Element: 2.0 | **Title:** Project

Responsible Org: SRR-PM - Project Manager | **Contact:** Jon Lunn | **Date Identified:** 23-Oct-06

Statement of Event: Long lead procurements are part of the TTP Project. Long lead procurements are not approved by DOE or are delayed. Project is delayed.

Likelihood:	Likely	**Basis:** DOE Order 413.3 allows for early approvals for long lead procurements, but, DOE posture challenges LLP prior to 90% design and performance baseline approval.
Consequence / Benefit:	Crisis	**Basis:** Non-approval of early procurement would result in delay to project.

Most Significant Cost Impact ($k): 1,000 | **Most Significant Schedule Impact:** 15 Mths

Level:	**High**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Project schedule includes request of early approvals of long lead procurements in order to obtain early DOE agreement on strategy. If this risk were to be realized, a BCP will be developed to obtain funding from DOE contingency to compensate for realized schedule impacts.

Handling Strategy Action Items:

HS Implementation Cost ($K):	0	**Basis:** Development of Critical Decision packages are required for this project and strategy for early release of procurement/construction activities is included in the CD packages. No additional cost will be incurred by the Project.
HS Implementation Schedule:	0	**Basis:** CD approval by DOE is within the current schedule.

Other Handling Strategies:

Statement of Residual Risk: Even with early submittal for long-lead procurement items, a risk remains that DOE may not approve early release of procurement. If this risk is realized BCP will be developed to obtain additional funding to support the schedule extension from DOE contingency.

Residual Likelihood:	Unl kely	**Basis:** Likelihood is reduced, but remains unlikely.
Residual Consequence:	Crisis	**Basis:** Non-approval of early procurement results in delay to project.

Residual Risk Level:	**High**			**Residual Impact Basis:** Worst Case: Non-approval of early procurement results in delay to project. Most L kely Case: Non-approval of early procurement results in some delay to project. Best Case: Non-approval of early procurement results in minor delay to project.
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact:	6 Wks	13 Wks	26 Wks	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: If this risk is realized, a BCP will be developed to obtain additional funding to support the schedule extension from DOE contingency.

Risk / Opportunity Assessment Form

ID Number: 034 **Revision:** 02 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Waste Feed Line Plugs			
Type: **Risk** Internal Technical	**Category:** SRR		
Assess. Element: 4.0	**Title:** Safety In Design		
Responsible Org: SRR-DA - Design Authority	**Contact:** Steve Hall	**Date Identified:** 23-Oct-06	
Statement of Event: Feed through nozzles to DMR plug due to large waste feed solids. DMR can not be operated, requiring design change and rework of the feed system.			
Likelihood:	Likely	**Basis:** Tank 48 is likely to have some particle sizes greater than what was used during simulant testing.	
Consequence / Benefit:	Significant	**Basis:** Plugged feed system requiring redesign.	
Most Significant Cost Impact ($k): 200	**Most Significant Schedule Impact:** 2 Mths		
Level:	**Moderate**	**Event Trigger:**	
Handling Strategy:	Avoid	**Description:** Thor Treatment Technologies (TTT) to assess potential for DMR feed nozzle plugging based on potential particle size limitations associated with the process and specify proposal for risk potential mitigation/elimination.	
Handling Strategy Action Items: 034-1 Request TTT to perform an assessment of potential for DMR feed nozzle plugging based on feed particle size limitations associated with the process and to respond with specific proposal(s) for risk potential mitigation/elimination., , , Sergio Mazul,			
HS Implementation Cost ($K):	0	**Basis:** Design of waste feed system is within the project baseline.	
HS Implementation Schedule:	0	**Basis:** No additional cost to design	
Other Handling Strategies:			
Statement of Residual Risk: Risk has been avoided.			
Residual Likelihood:		**Basis:**	
Residual Consequence:		**Basis:**	
Residual Risk Level:			**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0
Residual Schedule Impact:	0	0	0
Impacted Scope of Work:			
Evaluation Comments:			
Event Comments:			

Risk / Opportunity Assessment Form

ID Number: 038 **Revision:** 04 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Availability Cannot be Achieved

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 1.0 | **Title:** Processing

Responsible Org: SRR-ENG - Engineering | **Contact:** Steve Brown | **Date Identified:** 23-Oct-06

Statement of Event: The FBSR design assumes a 75% attainment. Actual operation of the process cannot reach availability/attainment goals. Re-design will be required to meet availability/attainment goals.

Likelihood:	Unl kely	**Basis:** The FBSR process is a "first of a kind" for SRS. First of a kind processess usually have unanticipated attainment problems during startup and commissioning.
Consequence / Benefit:	Critical	**Basis:** Failure to achieve attainment will result in a longer processing period for Tank 48 contents. If detected during testing and cold runs it would result in a delay to Project completion while vendor corrected problem.

Most Significant Cost Impact ($k): 0 | **Most Significant Schedule Impact:** 3 Mths

Level:	**Moderate**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Vendor is required to perform a RAMI analysis on the system. Have Vendor engineers on hand during vendor testing, startup and cold runs. This is not considered a risk to the project, as risk during startup has been avoided, however this is an operational vulnerability that could impact the System Plan.

Handling Strategy Action Items:

038-1 Arrange for Vendor Engineers to be present during SAT, startup and cold runs., , , Sergio Mazul,
038-2 Identify specific unit operations that would potentially benefit from a mockup., , , Steve Hall,
038-3 Perform mockup, troubleshoot and streamline unit ops as required., , , Chris Myers,

HS Implementation Cost ($K):	100	**Basis:** Cost of Vendor Engineers' support, mockup testing and rework.
HS Implementation Schedule:	2 Mths	**Basis:** Duration of activities

Other Handling Strategies:

Statement of Residual Risk: After streamlining operations as much as feasible, a risk of not being to reach 75% attainment may still exist. The inability of the scaled-up FBSR to meet throughput requirements is is not considered a risk to the project, however this is an operational vulnerability that could impact the System Plan.

Residual Likelihood:		**Basis:**		
Residual Consequence:		**Basis:**		
Residual Risk Level:				**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	
Residual Schedule Impact:				

Impacted Scope of Work:

Evaluation Comments:

Event Comments: Action Item 1 modified, action item 4 added, and action items 2 and 3 deleted as they are no longer being performed. The inability of the scaled-up FBSR to meet availability requirements is not considered a risk to the project if realized after cold runs and testing, however this is an issue that will impact the System Plan. This issue should be evaluated by the Planning Group for impact to the System Plan. (Reference PBS-SR-0014, Risk- 122)

Risk / Opportunity Assessment Form

ID Number: 043 **Revision:** 03 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Engineered Equipment (Modules/Skids) Deliveries do not Support Project Schedule

Type: **Risk** External Programmatic | **Category:** SRR

Assess. Element: 2.0 | **Title:** Project

Responsible Org: SRR-DS - Design Services | **Contact:** Sergio Mazul | **Date Identified:** 23-Oct-06

Statement of Event: Engineered equipment (modules/skids) are required to be fabricated, component tested and released early to support the project schedule. Delivery of equipment does not support the project schedule. Project is delayed.

Likelihood:	Likely	**Basis:** Early release of equipment is required to support project schedule.
Consequence / Benefit:	Critical	**Basis:** Project delays and added cost to the Project.

Most Significant Cost Impact ($k): 500 | **Most Significant Schedule Impact:** 3 Mths

Level:	**High**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Have an expeditor assigned to the Project Team to expedite and track procurements.

Handling Strategy Action Items:

043-1 Assign an expeditor assigned to the Project Team to expedite and track procurements., , , Jon Lunn,

043-2 Assign resident personnel with TTT during the design and fabrication effort., , , Jon Lunn,

HS Implementation Cost ($K):	0	**Basis:** Costs within the current baseline.
HS Implementation Schedule:	0	**Basis:** No impact to schedule baseline.

Other Handling Strategies:

Statement of Residual Risk: May need to pay expediting fees to meet our need dates. ($200K)

Residual Likelihood:	Unl kely	**Basis:** Likelihood of realizing risk has been reduced with the assignment of a FPEG
Residual Consequence:	Critical	**Basis:** Expediting fees are required to avoid schedule impact

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: Expediting fees are required to avoid schedule impact Most L kely Case: Expediting fees are required to avoid schedule impact Best Case: Risk is realized, but workarounds can be used
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 100	**Worst Case** 200	
Residual Schedule Impact:	0	2 Mths	3 Mths	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 046 **Revision:** 03 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Material Deposits Build up in Process Equipment During Operation

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 4.0 | **Title:** Safety In Design

Responsible Org: SRR-ENG - Engineering | **Contact:** Steve Brown | **Date Identified:** 23-Oct-06

Statement of Event: Rate of deposition is unknown. Deposition may lead to blockage of instrumentation sensors (in addition instrumentation important to safety) within process equipment and loss of throughput capacity and increased maintenance downtime due to build-up on the process equipment.

Likelihood:	Likely	**Basis:** Build up of material was identified inside the DMR and process equipment during testing.
Consequence / Benefit:	N/A	**Basis:** Delay in Tank 48 return to service due to the loss of capacity and shutdowns.

Most Significant Cost Impact ($k): N/A | **Most Significant Schedule Impact:** N/A

Level:		**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Analyze material samples collected from Hazen testing. Inspect DMR for build-up during all testing and develop ops and maintenance procedures for preventing build-up or cleaning during radioactive operation. This risk will not impact the project, however will remain as a potential operational vulnerability.

Handling Strategy Action Items:

046-2 Inspect DMR for build-up during all testing, , , Satish Shah,
046-3 Develop maintenance procedures for cleaning., , , Satish Shah,
046-4 Inspect for build-up during startup testing., , , Steve Brown,
046-5 Include instrument pluggage in RAMI analysis., , , Sergio Mazul,

HS Implementation Cost ($K):	0	**Basis:** Cost of testing is within the current cost baseline.
HS Implementation Schedule:	0	**Basis:** Testing is within the current schedule baseline.

Other Handling Strategies:

Statement of Residual Risk: The residual risk will not impact the project, however will remain as a potential operational vulnerability.

Residual Likelihood:		**Basis:**		
Residual Consequence:		**Basis:**		
Residual Risk Level:				**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	
Residual Schedule Impact:				

Impacted Scope of Work:

Evaluation Comments:

Event Comments: Reference PBS-SR-0014 (Y-RAR-G-00022) Risk 122.

Risk / Opportunity Assessment Form

ID Number: 050 **Revision:** 02 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Tank Farm Equipment Failure			
Type: **Risk** External Programmatic	**Category:** SRR		
Assess. Element: 1.0	**Title:** Processing		
Responsible Org: SRR-PO - Project Owner	**Contact:** John Contardi	**Date Identified:** 23-Oct-06	
Statement of Event: The successful processing of Tank 48 waste is dependent upon the ability of the HTF infrastructure to meet FBSR interface demands by having the required support systems and interfacing systems available when needed. If HTF systems are not available when required processing cannot proceed.			
Likelihood:	Unl kely	**Basis:** The interfacing systems and utilities are aged, however regular, planned preventive maintenance is being performed to maximize their availability and reliability.	
Consequence / Benefit:	N/A	**Basis:** The reliability and availability of HTF infrastructure is beyond the scope of this project. However if these systems fail to be available when required, startup or testing may be minimally impacted or in the long-term, the System Plan may be impacted.	
Most Significant Cost Impact ($k): N/A		**Most Significant Schedule Impact:** N/A	
Level:		**Event Trigger:**	
Handling Strategy:	Accept	**Description:** This risk is accepted as handling of this risk is presently being performed by Tank Farm operations by establishing system health evaluation of key systems that can impact major processing activities. Implementing the requirements of the evaluation e.g. ensuring adequate spare parts/equipment are identified and on hand is being performed to support facility operations. Completion of this program risk handling strategy will bring the probability and consequence of equipment failure to levels that are acceptable, no longer considered as a risk and have no impact to the Project. It may remain an operational vulnerability.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):		**Basis:**	
HS Implementation Schedule:		**Basis:**	
Other Handling Strategies:			
Statement of Residual Risk:			
Residual Likelihood:		**Basis:**	
Residual Consequence:		**Basis:**	
Residual Risk Level:			**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**
Residual Schedule Impact:			
Impacted Scope of Work:			
Evaluation Comments:			
Event Comments: The inability of the HTF infrastructure to meet availability and reliability requirements is an issue that will impact the System Plan. This issue has been evaluated for impact to the System Plan (Ref PBS-SR-0014 - 011) and handling strategies are underway.			

Risk / Opportunity Assessment Form

ID Number: 056 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Facility Support System Capacity/Life			
Type: **Risk** External Programmatic	**Category:** SRR		
Assess. Element: 2.1	**Title:** Utilities Systems Tie-ins		
Responsible Org: SRR-DS - Design Services	**Contact:** Sergio Mazul	**Date Identified:** 24-Oct-06	
Statement of Event: The design and operation of the FBSR is relies upon site utility systems meeting their design capacities. Site utilities do not meet their performance requirements and are not reliable. FBSR process cannot operate by relying on site utilities.			
Likelihood:	Unl kely	**Basis:** Most of the site utilities are currently being used.	
Consequence / Benefit:	N/A	**Basis:** TTP Project will ensure that site utilities are have adequate capacity, however, the continued addition of other projects and the age of the utility systems will remain an operational vulnerability.	
Most Significant Cost Impact ($k): N/A		**Most Significant Schedule Impact:** N/A	
Level:		**Event Trigger:**	
Handling Strategy:	Mitigate	**Description:** Determine the utility needs earlier during preliminary design and verify their availability. Have maintenance and Ops verify that the utilities are in good working order during the design phase. Schedule impact avoided. Ensure the process design can handle anticipated support system unplanned interruptions without undue consequences by either prevention (e.g. safe shutdown, stand by mode, etc.) or by including means to recover (e.g. flushing). TTP Project will ensure that site utilities are have adequate capacity, however, the continued addition of other projects and the age of the utility systems will remain an operational vulnerability.	
Handling Strategy Action Items: 056-1 Determine the utility needs earlier during preliminary design., , , Sergio Mazul, 056-2 Perform study to verify utilities availability., , , Sergio Mazul, 056-3 Ensure the process design can handle anticipated support system unplanned interruptions without undue consequences by either prevention (e.g. safe shutdown, stand by mode, etc.) or including means to recover (e.g. flushing), , , Sergio Mazul,			
HS Implementation Cost ($K):	0	**Basis:** No additional cost as this will be performed as part of design	
HS Implementation Schedule:	0	**Basis:** The duration of utilities verification activity. This will be performed early and in parallel with other design activities.	
Other Handling Strategies:			
Statement of Residual Risk: This remains an operational vulnerability.			
Residual Likelihood:		**Basis:**	
Residual Consequence:		**Basis:**	
Residual Risk Level:			**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely** / **Worst Case**	
Residual Schedule Impact:			
Impacted Scope of Work:			
Evaluation Comments:			
Event Comments: For electrical support system capacity risks, refer to Risk 023.			

Risk / Opportunity Assessment Form

ID Number: 057 **Revision:** 02 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Integration of Multiple Internal Technical Agencies

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-DS - Design Services | **Contact:** Sergio Mazul | **Date Identified:** 24-Oct-06

Statement of Event: The project will require effective coordination of the following technical agencies interactions and deliverables: Operations, HTF Engineering, Design Engineering, Construction, Transportation, Rigging, RadCon, environmental permitting. The technical interaction between different work groups and disciplines can not be coordinated effectively.
Lack of coordination causes delays in the project schedule and ineffective use of resources.

Likelihood:	Likely	**Basis:** Project requires significant technical integration.
Consequence / Benefit:	Critical	**Basis:** Delays in the project schedule, add costs, and ineffective use of resources.

Most Significant Cost Impact ($k): 500 | **Most Significant Schedule Impact:** 3 Mths

Level:	**High**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Assign a PEM to coordinate this effort and have regular Engineering Meetings with the total engineering team.

Handling Strategy Action Items:

HS Implementation Cost ($K):	0	**Basis:** This activity can be performed without any additional cost
HS Implementation Schedule:	0	**Basis:** Throughout the entire project design phase.

Other Handling Strategies:

Statement of Residual Risk: Integration problems mat still occur.

Residual Likelihood:	Unl kely	**Basis:** The probability of this risk occuring has been reduced with the additional management steps taken.
Residual Consequence:	Marginal	**Basis:** Minor integration issues require resolution, design rework, cost and schedule impact.

Residual Risk Level:	**Low**			**Residual Impact Basis:** Worst Case: Integration issues require resolution, design rework, cost and schedule impact. Most L kely Case: Minor integration issues require resolution, design rework, cost and schedule impact. Best Case: Minor integration issues require resolution but do not impact schedule or cost.
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 50	**Worst Case** 100	
Residual Schedule Impact:	0	1 Wk	2 Wks	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 058 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Multiple Design Input Documents			
Type: **Risk** Internal Technical	**Category:** SRR		
Assess. Element: 3.0	**Title:** General		
Responsible Org: SRR-DS - Design Services	**Contact:** Sergio Mazul	**Date Identified:** 24-Oct-06	
Statement of Event: The design requirements for the project will be developed and documented in a TR&C and the procurement of the process modules will be performed using a procurement specification. Requirements could be omitted or mis-stated in either document causing conflicts between the two documents and eventually installation and operational problems.			
Likelihood:	Very Unlikely	**Basis:** Based on experience of other first of a kind projects at SRS, multiple reviews have been performed.	
Consequence / Benefit:	Marginal	**Basis:** Delays in the project schedule, add costs, and ineffective use of resources.	
Most Significant Cost Impact ($k): 50		**Most Significant Schedule Impact:** 2 Wks	
Level:	**Low**	**Event Trigger:**	
Handling Strategy:	Mitigate	**Description:** Assign a PEM to coordinate this effort and have regular Engineering Meetings with the total engineering team.	
Handling Strategy Action Items:			
HS Implementation Cost ($K):	0	**Basis:** This activity can be performed without any additional cost.	
HS Implementation Schedule:	0	**Basis:** Throughout the entire project design phase.	
Other Handling Strategies:			
Statement of Residual Risk: Integration problems may still occur.			
Residual Likelihood:	Very Unlikely	**Basis:** The probability of this risk occuring has been reduced with the additional management steps taken.	
Residual Consequence:	Marginal	**Basis:** Minor integration issues require resolution, design rework, cost and schedule impact.	
Residual Risk Level:	**Low**		**Residual Impact Basis:** Worst Case: Integration issues require resolution, design rework, cost and schedule impact. Most L kely Case: Minor integration issues require resolution, design rework, cost and schedule impact. Best Case: Minor integration issues require resolution but do not impact schedule or cost.
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 15	**Worst Case** 25
Residual Schedule Impact:	0	1 Wk	2 Wks
Impacted Scope of Work:			
Evaluation Comments:			
Event Comments:			

Risk / Opportunity Assessment Form

ID Number: 059 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Undefined Disposal Method for Waste Generated During Operations and Eventual Stand-by/Lay-up

Type: **Risk** Internal Programmatic | **Category:** SRR

Assess. Element: 4.0 | **Title:** Safety In Design

Responsible Org: SRR-ENG - Engineering | **Contact:** Steve Brown | **Date Identified:** 24-Oct-06

Statement of Event: Additional waste e.g. filters, failed components, DMR/CRR bed material etc., will require disposal during operations and a disposal path for equipment from eventual stand-by/lay-up of the FBSR process should be identified during the design phase. No disposal path for additional waste can be found and aspects of the design which are necessary to assist in stand-by/lay-up have not been incorporated.

Likelihood:	Unl kely	**Basis:** Filters, failed components, DMR/CRR bed material etc., will require replacement during 2 years of operation. This equipment has not been qualified for disposal in solid waste, however, significant progress has been made and resolution is close.
Consequence / Benefit:	Significant	**Basis:** A disposal path for waste must be identified prior to waste generation (e.g., filter, failed components or bed material removal etc) or obtain Site Manager's approval. Once a disposal path is identified or Site manager approves, the filter, bed material etc., could be removed and the process restarted. A cost and schedule impact is realized to identify disposal path.

Most Significant Cost Impact ($k): 50 | **Most Significant Schedule Impact:** 1 Mths

Level:	**Moderate**	**Event Trigger:**
Handling Strategy:	Avoid	**Description:** Identify disposal path upfront in preparation for filter, DMR/CRR bed material/fouled components replacement.

Handling Strategy Action Items:

059-1 Add Waste Disposal Plan update to the Project Schedule., , , Steve Brown,

059-2 Identify disposal path upfront in preparation for filter replacement in Waste Disposal Plan update., , , Steve Brown,

059-3 Develop a plan to address storage/reuse and/or disposal of items from stand-by or lay-up. Examples include DMR and CRR bed material., , , Steve Brown,

HS Implementation Cost ($K):	0	**Basis:** Within current project baseline.
HS Implementation Schedule:	0	**Basis:** No impact to project baseline schedule.

Other Handling Strategies:

Statement of Residual Risk:

Residual Likelihood:		**Basis:**		
Residual Consequence:		**Basis:**		
Residual Risk Level:				**Residual Impact Basis:**
Residual Cost Impact ($K):	Best Case 0	Most Likely 0	Worst Case 0	
Residual Schedule Impact:	0	0	0	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 061 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Facility Space and Weight Limitations

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 2.2.1 | **Title:** Building 241-96H Structure

Responsible Org: SRR-DS - Design Services | **Contact:** Sergio Mazul | **Date Identified:** 24-Oct-06

Statement of Event: The FBSR process will be installed within Building 241-96H. The available space/weight capacity within the building is insufficient to house the process.

Likelihood:	Likely	**Basis:** Data from the FBSR Vendor indicates that limitations in space/weight to house the process could cause design rework.
Consequence / Benefit:	Crisis	**Basis:** The Project would not be a viable option without significant design rework.

Most Significant Cost Impact ($k): 10,000 | **Most Significant Schedule Impact:** 8 Mths

Level:	**High**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Asbuilt available space within the building. Make the space availability/weight limits a requirement for the FBSR Vendor.

Handling Strategy Action Items:

061-10 Regularly discuss remote tooling and maintenance interfaces to ensure design allows space for these operations (Henkel), , , John Contardi,

061-11 Provide facility weight limitations to vendor., , , John Contardi,

061-3 Obtain dimensional information at vendor's preliminary design completion (Re-evaluate space limitations based on coal carryover findings)., , , Sergio Mazul,

061-4 Identify additional D&R as applicable, , , Sergio Mazul,

061-6 Reconfirm space limitations after preliminary design., , , Sergio Mazul,

061-7 Utilize the vendor's 3-D model to jointly perform dimensional reviews, , , Sergio Mazul,

061-8 Investigate and recommend process and design modifications to reduce footprint and weight., , , John Contardi,

061-9 Vendor to exercise internal and external change control (e.g. project deviation notices)., , , Jon Lunn,

HS Implementation Cost ($K):	0	**Basis:** No additional cost to specify this requirement.
HS Implementation Schedule:	0	**Basis:** No impact to schedule.

Other Handling Strategies:

Statement of Residual Risk: Some minor interferences may still occur and/or rework to accommodate additional loading.

Residual Likelihood:	Likely	**Basis:** The likelihood has been reduced but remains likely.
Residual Consequence:	Crisis	**Basis:** Minor re-design and delay

Residual Risk Level:	**High**			**Residual Impact Basis:** Worst Case: Minor re-design cost and delay Most L kely Case: Minor re-design cost and delay Best Case: Minor re-design cost, no schedule impact
Residual Cost Impact ($K):	**Best Case** 500	**Most Likely** 1,000	**Worst Case** 5,000	
Residual Schedule Impact:	0	2 Mths	6 Mths	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: Reference TTT Risk # FBSR 23.

Risk / Opportunity Assessment Form

ID Number: 062 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Project Strategy Does Not Support Tank 48 Return to Service Need			
Type: **Risk** Internal Programmatic	**Category:** SRR		
Assess. Element: 3.0	**Title:** General		
Responsible Org: SRR-PM - Project Manager	**Contact:** Jon Lunn	**Date Identified:** 24-Oct-06	
Statement of Event: Tank 48 is required to be placed back in service to support the Liquid Waste System Plan. The 241-96H FBSR process is designed to be installed and process Tank 48 contents to allow the tank to be placed back into service when required. A contract strategy must be developed and approved by DOE to be implemented in the timeframe allowed. A contract strategy cannot be developed that will both meet with DOE approval, be fully integrated with the proposed project logic and meet the LLWDSP Tank 48 return to service target date.			
Likelihood:	Very Likely	**Basis:** The current project schedule range and operational duration may not support this date.	
Consequence / Benefit:	N/A	**Basis:** If Tank 48 can not be returned to service to support the System Plan, future Tank Closure commitments may not be achieved. This is not a risk for the Project, as any extension to the proposed schedule (based on integration of safety basis development logic, vendor activity durations and project integration) will be included as part of establishing a CD-2 Project baseline activity or as a BCP to the existing baseline. However being unable to return Tank 48 to service in accordance with the System Plan need is an issue to be resolved by the LWO Planning Group.	
Most Significant Cost Impact ($k): N/A		**Most Significant Schedule Impact:** N/A	
Level:		**Event Trigger:**	
Handling Strategy:	Accept	**Description:** If Tank 48 can not be returned to service to support the System Plan, future Tank Closure commitments may not be achieved. This is not a risk for the Project, however it is an issue to be resolved by the LWO Planning Group. (Reference PBS-SR-0014, Risk 184).	
Handling Strategy Action Items:			
HS Implementation Cost ($K):		**Basis:**	
HS Implementation Schedule:		**Basis:**	
Other Handling Strategies:			
Statement of Residual Risk:			
Residual Likelihood:		**Basis:**	
Residual Consequence:		**Basis:**	
Residual Risk Level:			**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely** / **Worst Case**	
Residual Schedule Impact:			
Impacted Scope of Work:			
Evaluation Comments:			
Event Comments: If Tank 48 can not be returned to service to support the System Plan, future Tank Closure commitments may not be achieved. This is not a risk for the Project, however it is an issue to be resolved by the LWO Planning Group. (Reference PBS-SR-0014, Risk 184)			

Risk / Opportunity Assessment Form

ID Number: 063 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: FBSR Equipment Transportation Requires Additional Precautions			
Type: **Risk** External Technical	**Category:** SRR		
Assess. Element: 2.0	**Title:** Project		
Responsible Org: SRR-DS - Design Services	**Contact:** Sergio Mazul	**Date Identified:** 24-Oct-06	
Statement of Event: The FBSR modules are to be transported to SRS using a commercial haulage contractor. The modules cannot be transported without a special vehicle or highway infrastructure. Project is delayed.			
Likelihood:	Very Unlikely	**Basis:** Transportation requirements are known and a special vehicle can be made available.	
Consequence / Benefit:	Significant	**Basis:** Project is delayed and additional precautions are taken prior to shipping.	
Most Significant Cost Impact ($k): 100		**Most Significant Schedule Impact:** 4 Weeks	
Level:	**Low**	**Event Trigger:**	
Handling Strategy:	Mitigate	**Description:** Plan up front in the design of the skids and coordinate with the Vendor to ensure special vehicles are available. Perform receipt inspection.	
Handling Strategy Action Items: 063-2 Review vendor's shipping strategy., , , Sergio Mazul, 063-3 Perform receipt inspection of FBSR skids and equipment., , , Bruce Dragon, 063-4 Review shipping precautions for refractory shipping (vendor refractory shipping plan)., , , Sergio Mazul,			
HS Implementation Cost ($K):	0	**Basis:** This cost is already within the project baseline, the work will be done earlier.	
HS Implementation Schedule:	0	**Basis:** No impact to schedule.	
Other Handling Strategies:			
Statement of Residual Risk: Prior shipping, additional precautions are identified.			
Residual Likelihood:	Very Unlikely	**Basis:** Likelihood has not been decreased.	
Residual Consequence:	Significant	**Basis:** Delay is realized while additional precautions are installed.	
Residual Risk Level:	**Low**		**Residual Impact Basis:** Worst Case: Delay is realized while additional precautions are installed. Most L kely Case: Some delay is realized while additional precautions are installed. Best Case: Precautions are installed without impact to cost or schedule
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 50	**Worst Case** 100
Residual Schedule Impact:	0	2 Wks	4 Wks
Impacted Scope of Work:			
Evaluation Comments:			
Event Comments:			

Risk / Opportunity Assessment Form

ID Number: 064 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Multiple External Interfaces

Type: **Risk** External Technical | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PM - Project Manager | **Contact:** Jon Lunn | **Date Identified:** 24-Oct-06

Statement of Event: The TTP project has multiple external interfaces (e.g. process equipment vendor, oxygen supply unit vendor, vendors for consumables etc.,). Integration of these interfaces is ineffective. Delays to the project occur.

Likelihood:	Likely	**Basis:** Processes exist for identification and early approval of long lead procurement. Organizations that support this project are subject to conflicting priorities.
Consequence / Benefit:	Critical	**Basis:** Delays in receipt of vendor supplied equipment/consumables would impact the project schedule. Delays in key resources could delay project activities.

Most Significant Cost Impact ($k): 750 | **Most Significant Schedule Impact:** 12 Wks

Level:	**High**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Schedule early approval of long lead procurements to ensure critical vendor information is available in a timely fashion. Integrate project activities into facility schedule. Establish project milestones to manage schedule float and visibility of project priorities.

Handling Strategy Action Items:

064-3 Establish project milestones to manage schedule float and visibility of project priorities., , , Jon Lunn,

HS Implementation Cost ($K):	0	**Basis:** Within project cost baseline.
HS Implementation Schedule:	0	**Basis:** No impact to project schedule.

Other Handling Strategies:

Statement of Residual Risk: Materials and resources still may not be available when needed.

Residual Likelihood:	Very Unlikely	**Basis:** The likelihood of having resource problems has been reduced by exercising additional project controls.
Residual Consequence:	Significant	**Basis:** Project is somewhat impacted by resource problems

Residual Risk Level:	**Low**			**Residual Impact Basis:** Worst Case: Project is still impcted by resource problems Most L kely Case: Project is somewhat impacted by resource problems Best Case: Resource problems occur, but work arounds can be found
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 50	**Worst Case** 100	
Residual Schedule Impact:	0	4	6 Wks	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 066 **Revision:** 03 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Emergent Startup Issues

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-ENG - Engineering | **Contact:** Steve Brown | **Date Identified:** 24-Oct-06

Statement of Event: There is minimal experience with the FBSR process in the DOE complex, and none at SRS. The FBSR process is new to SRS. Issues emerge during SRS startup that delay startup and affect operations. Minimum facility acceptance testing is planned.

Likelihood:	Very Likely	**Basis:** It is likely that issues will emerge during SRS startup that will delay startup and affect operations based on lessons learned from other new first of the kind processes at SRS.
Consequence / Benefit:	Crisis	**Basis:** Possible delays to perform troubleshooting.

Most Significant Cost Impact ($k): 300 | **Most Significant Schedule Impact:** 20 Wks

Level:	**High**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Incorporate lessons learned. Ensure sufficient time is allotted for operator/startup training.

Handling Strategy Action Items:

066-3 Incorporate lessons learned into FBSR design., , , Sergio Mazul,
066-4 Schedule operator/startup training time., , , Jon Lunn,
066-5 Assign startup engineers/operators to idaho to support startup of that facility and gain experience., , , Jon Lunn,

HS Implementation Cost ($K):	0	**Basis:** Within the current baseline.
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies:

Statement of Residual Risk: Some startup issues may still arise

Residual Likelihood:	Likely	**Basis:** Incorporating lessons learned and training will reduce the likelihood of issues during startup.
Residual Consequence:	Significant	**Basis:** Minor startup issues require resolution, incurring cost and schedule impact

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: Startup issues require resolution, incurring cost and schedule impact Most L kely Case: Minor startup issues require resolution, incurring cost and schedule impact Best Case: Minor startup issues require resolution, incurring cost and schedule impact
Residual Cost Impact ($K):	**Best Case** 40	**Most Likely** 100	**Worst Case** 125	
Residual Schedule Impact:	1 Wk	4 Wks	8 Wks	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 069 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Facility Services Design Complexity

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 2.1 | **Title:** Utilities Systems Tie-ins

Responsible Org: SRR-DS - Design Services | **Contact:** Sergio Mazul | **Date Identified:** 24-Oct-06

Statement of Event: The design of tie-ins to facility services is assumed to be straight forward. Designs for service tie-ins encounter issues which make the implementation of a successful design more complex than previously assumed.

Likelihood:	Unl kely	**Basis:** The design of tie-ins to facility services is usually straightforward.
Consequence / Benefit:	Significant	**Basis:** Delays in the project schedule, additional costs, and ineffective use of resources.

Most Significant Cost Impact ($k): 125 | **Most Significant Schedule Impact:** 3 Wks

Level:	**Moderate**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Specify and/or coordinate the tie-in point in the specification or during the review and approval of the Vendor design.

Handling Strategy Action Items:

069-1 Specify and/or coordinate the tie-in point in the specification or during the review and approval of the Vendor design., , , Sergio Mazul,

HS Implementation Cost ($K):	0	**Basis:** Can be accommodated without any additional cost.
HS Implementation Schedule:	0	**Basis:** Will be part of vendor design review and approval process.

Other Handling Strategies:

Statement of Residual Risk: Some minor problems may still be encountered

Residual Likelihood:	Very Unlikely	**Basis:** Likelihood has been reduced by specifying tie-in points and reviewing vendor designs for correct tie-ins.
Residual Consequence:	Marginal	**Basis:** Minor rework required. Cost and schedule delay

Residual Risk Level:	**Low**			**Residual Impact Basis:** Worst Case: Some rework required. Cost and schedule delay Most L kely Case: Minor rework required. Cost and schedule delay Best Case: Minor rework required. Cost but no schedule delay
Residual Cost Impact ($K):	**Best Case** 25	**Most Likely** 50	**Worst Case** 100	
Residual Schedule Impact:	0	1 Wk	2 Wks	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 070 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Persistent Contamination Control Issues

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 4.0 | **Title:** Safety In Design

Responsible Org: SRR-DA - Design Authority | **Contact:** Steve Hall | **Date Identified:** 24-Oct-06

Statement of Event: It is assumed that the design of the Tank 48 FBSR will limit contamination control issues. The FBSR process is found to have aspects of the design and operational strategy which may create persistent contamination control problems.

Likelihood:	Unl kely	**Basis:** This is a new process at SRS and has operational differences with established facilities however, design will significantly prevent these issues e.g. use of welded connections.
Consequence / Benefit:	Significant	**Basis:** During operations a rising level of contamination occurs. Decontamination costs, loss of production and modification to correct problem before process is allowed to restart. (Assume 50k for cleanup, 50k for modification and 2 mths delay)

Most Significant Cost Impact ($k): 100 | **Most Significant Schedule Impact:** 2 Mths

Level:	**Moderate**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Design equipment and facility for ease of decontamination. During cold runs, investigate potential contamination pathways and perform NDE per appropriate code (e.g. Hydrostatic testing, weld UT/MT/PT or rad inspection.

Handling Strategy Action Items:

070-1 Design equipment and facility for prevention and ease of decontamination (including evaluation of lessons learned from SPF and ARP/MCU)., , , Sergio Mazul,

070-2 During cold runs investigate potential contamination pathways., , , Sergio Mazul,

070-3 Perform NDE per appropriate code (e.g. Hydrostatic testing, weld UT/MT/PT or rad inspection., , , Mary Pallon,

HS Implementation Cost ($K):	0	**Basis:** Within the existing cost baseline.
HS Implementation Schedule:	0	**Basis:** No impact to the schedule baseline.

Other Handling Strategies:

Statement of Residual Risk: Contamination may still occur, but to a lesser degree.

Residual Likelihood:	Very Unlikely	**Basis:** Testing should have identified and corrected major potential contamination pathways.
Residual Consequence:	Marginal	**Basis:** Persistent contamination control issue occurs which requires operations to be halted while decontamination and corrective action is taken.

Residual Risk Level:	**Low**			**Residual Impact Basis:** Worst Case: Persistent contamination control issues occur, require corrective action, possible minor design modification and impact production. Most L kely Case: Persistent contamination control issues occur, require corrective action and impact production. Best Case: Persistent contamination control issues occur, but are minor and do not impact production.
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 10	**Worst Case** 50	
Residual Schedule Impact:	0	1 Wk	2 Wks	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 072 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Module Handling and Installation

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 2.0 | **Title:** Project

Responsible Org: - | **Contact:** Mary Pallon | **Date Identified:** 24-Oct-06

Statement of Event: The FBSR process equipment will be provided from the vendor in large modules which are assumed to be capable of being installed without building modification. A risk exists that these modules require additional specialized lifting equipment (cranes, jacks, rollers) and additional building modifications to allow their lifting and positioning inside Building 241-96H.

Likelihood:	Likely	**Basis:** Based on conceptual data.
Consequence / Benefit:	Marginal	**Basis:** Delays while specialized rigging equipment is fabricated and cost of fabrication and any additional building modifications.

Most Significant Cost Impact ($k): 100 | **Most Significant Schedule Impact:** 2 Wks

Level:	**Moderate**	**Event Trigger:**
Handling Strategy:	Avoid	**Description:** Ensure requirements are placed in procurement specification for handling equipment to be provided by the vendor. Review vendor design and lifting procedures. Review mode. Perform constructability reviews.

Handling Strategy Action Items:

072-2 Review vendor lifting procedures, , , Mary Pallon,
072-3 Review vendor design, , , Steve Hall,
072-4 Develop and issue project specific QA plan., , , Woody Meadows,
072-5 Assign constructability representative to ensure vendor module design and fabrication support installation into 241-96H., , , Mary Pallon,
072-6 Constructability representative to interface with construction department to ensure lift plans and rigging equipment align with module design and fabrication., , , Jack Thompson,
072-7 Perform model reviews to validate module installation., , , Mary Pallon,

HS Implementation Cost ($K):	0	**Basis:** Will be included in subcontractor estimate
HS Implementation Schedule:	0	**Basis:** Will be included in subcontractor schedule

Other Handling Strategies:

Statement of Residual Risk: Risk has been avoided

Residual Likelihood:		**Basis:**		
Residual Consequence:		**Basis:**		
Residual Risk Level:				**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact:	0	0	0	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 073 **Revision:** 03 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Secondary Containment Required For Off-Gas and Secondary Confinement			
Type: **Risk** Internal Technical	**Category:** SRR		
Assess. Element: 4.0	**Title:** Safety In Design		
Responsible Org: SRR-DA - Design Authority	**Contact:** Steve Hall	**Date Identified:** 24-Oct-06	
Statement of Event: The current design assumes that the off-gas can be routed through the interior of the building to connect with the existing HVAC System. A risk exists that the configuration of the off-gas line/secondary confinement requires that it must exit the building to allow a tie-in and will require a secondary confinement to be constructed for that section of line.			
Likelihood:	Very Unlikely	**Basis:** The off-gas line/secondary confinement will be routed through blockouts made in the existing wall. These blockouts would have to have significant interferences which cannot be re-engineered to maintain wall structural integrity.	
Consequence / Benefit:	Significant	**Basis:** Would require a redesign of off gas/secondary confinement system piping and result in lost project time.	
Most Significant Cost Impact ($k): 200		**Most Significant Schedule Impact:** 8 Wks	
Level:	**Low**	**Event Trigger:** During design activities it is determined that the off gas line must be routed outside of the building.	
Handling Strategy:	Avoid	**Description:** Design ductwork as Level 5.	
Handling Strategy Action Items: 073-3 Specifiy ductwork design as Level 5., , , Sergio Mazul,			
HS Implementation Cost ($K):	0	**Basis:** Within the current cost baseline.	
HS Implementation Schedule:	0	**Basis:** No impact to the project schedule.	
Other Handling Strategies:			
Statement of Residual Risk:			
Residual Likelihood:		**Basis:**	
Residual Consequence:		**Basis:**	
Residual Risk Level:			**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely** / **Worst Case**	
Residual Schedule Impact:			
Impacted Scope of Work:			
Evaluation Comments:			
Event Comments:			

Risk / Opportunity Assessment Form

ID Number: 075 **Revision:** 03 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Design/ Operational Life Is Inadequate

Type: **Risk** Internal Programmatic | **Category:** SRR

Assess. Element: 4.0 | **Title:** Safety In Design

Responsible Org: SRR-DA - Design Authority | **Contact:** Steve Hall | **Date Identified:** 1-Nov-06

Statement of Event: Currently a design life of 5 years has been selected based on an operational life of 2 years. The process is required to operate for longer than assumed. Major equipment (DMR, CRR Filter, pumps etc.,) will begin to fail and require replacement.

Likelihood:	Likely	**Basis:** Perturbations in processing schedules, emergent conflicts in operational priorities etc., could extend the processing period past the life of the facility.
Consequence / Benefit:	Crisis	**Basis:** Worst case would be a major vessel failure e.g. DMR, resulting in a shutdown for DMR removal, procurement, replacement, testing and restart. This would not impact the project, however is an operational vulnerability.

Most Significant Cost Impact ($k): 500 | **Most Significant Schedule Impact:** > 1 Yr

Level:	**High**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Develop procurement specification to ensure a robust design of major equipment. During startup testing, focus on identification of adverse indications that may reduce life expectancy and correct whenever feas ble. Perform a RAMI analysis. Even with a robust design and minimization of adverse operational impacts to the system, an operational vulnerability remains that a failure could occur by operating the system outside of the planned operational life. This does not impact the project and the vulnerability has been accepted by operations.

Handling Strategy Action Items:

075-3 During startup testing, focus on identification of adverse indications that may reduce life expectancy and correct whenever feasible., , , Steve Hall,

075-4 Perform a RAMI analysis to identify components that will require replacement during operationa; life and include in design., , , Sergio Mazul,

075-5 Incorporate lessons learned from ARP/MCU project., , , Sergio Mazul,

075-6 Develop a layup strategy to minimize impact of extended inoperation., , , Sergio Mazul,

075-7 Obtain a listing of spare parts., , , Sergio Mazul,

075-8 Develop a PM Plan, , , Sergio Mazul,

075-9 Evaluate the use of the structural integrity program to monitor the health of the system., , , John Contardi,

HS Implementation Cost ($K):	0	**Basis:** Within the current cost baseline.
HS Implementation Schedule:	0	**Basis:** No impact to the schedule baseline.

Other Handling Strategies:

Statement of Residual Risk: Even with a robust design and minimiziation of adverse operational impacts to the system, an operational vulnerability remains that a failure could occur by operating the system outside of the planned operational life. This does not impact the project and the vulnerability has been accepted by operations.

Residual Likelihood:		**Basis:**		
Residual Consequence:		**Basis:**		
Residual Risk Level:				**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	
Residual Schedule Impact:				

Risk / Opportunity Assessment Form

ID Number: 075 **Revision:** 03 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Impacted Scope of Work:

Evaluation Comments:

Event Comments: Consider as a risk for PBS-SR-0014 if FBSR is to be used for heel removal processing. Operational life is limited to 2 yrs after starting hot ops.

Risk / Opportunity Assessment Form

ID Number: 076 **Revision:** 04 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Aggressive Post Installation Testing Schedule

Type: **Risk** Internal Programmatic | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-DA - Design Authority | **Contact:** Steve Hall | **Date Identified:** 8-Nov-06

Statement of Event: Project assumes that an aggressive post installation testing period is sufficient. This assumption is later proven incorrect as post installation testing is not able to be completed in accordance with this schedule.

Likelihood:	Likely	**Basis:** This is a new process at SRS and is l kely to encounter problems during post installation testing.
Consequence / Benefit:	Significant	**Basis:** 1 month delay and additional cost to perform retesting and minor rework/procedure revisions.

Most Significant Cost Impact ($k): 100 | **Most Significant Schedule Impact:** 1 Mth

Level:	**Moderate**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** PS SSCs require a commensurate level of QA, these activities will normally include QA inspection, witnessing vendor validation/component testing/critical installation points, ensuring lessons learned are documented, reviewing and approving vendors QA, assuring SOW Engineering documents/inspection and examination procedures/startup procedures/SOW testing plans and procedures are statused 1 or 5. Additionally: Assure that the validation test lessons learned are incorporated into the FBSR design; develop and issue project specific QA Plan. Assign startup engineers/operators to Idaho startup.

Handling Strategy Action Items:

076-3 Assure that the validation test lessons learned are incorporated into the FBSR design., , , Steve Brown,

076-5 Ensure scope and schedule for testing are emphasized, adequately planned, and managed to support an aggressive schedule., , , Steve Hall,

076-6 Assign startup engineers/operators to gain experience during Idaho startup., , , Jon Lunn,

HS Implementation Cost ($K):	0	**Basis:** Within the current baseline.
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies:

Statement of Residual Risk: Even with inspection and verification, other elements may contribute to hamper installation testing.

Residual Likelihood:	Unl kely	**Basis:** The likelihood is reduced and potential wiring and instrumentation problems have been eliminated.
Residual Consequence:	Marginal	**Basis:** Minor rework is required

Residual Risk Level:	**Low**			**Residual Impact Basis:** Worst Case: Some rework is required Most L kely Case: Minor rework is required Best Case: minimal rework is required, however it does not impact the schedule
Residual Cost Impact ($K):	**Best Case** 10	**Most Likely** 25	**Worst Case** 50	
Residual Schedule Impact:	0	1 Wk	2 Wks	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 082 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Organic Carries Over to Product Storage Tank			
Type: **Risk** Internal Technical	**Category:** SRR		
Assess. Element: 4.0	**Title:** Safety In Design		
Responsible Org: SRR-DA - Design Authority	**Contact:** Steve Hall	**Date Identified:** 22-Jan-07	
Statement of Event: During normal operating conditions, organics will be destroyed by steam reforming to within acceptable limits for transfer of Product Storage Tank contents to Tank Farm receipt tank. If it is possible that during off-normal operating conditions a portion of organics is not destroyed and could be transferred back to the Tank Farm, this event would have to be prevented.			
Likelihood:	Unl kely	**Basis:** It is unlikely that this will occur as the FBSR includes process controls for temperature and upset conditions to ensure the feed is treated. A credited Administrative Control (i.e., Product Validation Program) is required because one potential event could challenge the initial conditions assumed in the current CSTF DSA and is identified in the Hazard Evaluation tables by placing (SC) after the listed control. The credited Administrative Control is required to protect the CSTF DSA requirements (i.e., 5% trace organics), which is required for tank detonation/deflagration events. The credited Administrative Control will ensure that the FBSR product be validated to protect the CSTF DSA requirements (i.e., 5% trace organics), prior to the transfer of the Product Storage Tank contents to a Tank Farm receipt tank. The Product Validation Program will be designated as a Specific Administrative Control (SAC). Sample capability will be provided to the Product Dissolution Tank or Product Storage Tank for sampling of the redissolved product stream following a process upset prior to transfer to the HTF Receipt Tank.		
Consequence / Benefit:	Significant	**Basis:** If it is possible that during off-normal operating conditions a portion of organics is not destroyed and could be transferred back to the Tank Farm, additional scope, possibly including Safety Class controls, would be added to the project.	
Most Significant Cost Impact ($k): 1,500		**Most Significant Schedule Impact:** 2 Mths	
Level:	**Moderate**	**Event Trigger:**	
Handling Strategy:	Avoid	**Description:** Provide a design constraint to the vendor at initial design for preventing organics from entering the PDT. Ensure the feature meets our needs during design review process. Provide sampling recycle capability.	
Handling Strategy Action Items: 082-4 Ensure this event is considered in CHA. (complete), , , Steve Hall, 082-5 Establish a disposition path (including sampling and recycle) for product material that may not meet Tank Farm transfer requirements., , , Steve Brown,			
HS Implementation Cost ($K):	1000	**Basis:** Cost to provide recycle capability.	
HS Implementation Schedule:	0	**Basis:** Specification in progress, no impact to project schedule.	
Other Handling Strategies:			
Statement of Residual Risk:			
Residual Likelihood:		**Basis:**	
Residual Consequence:		**Basis:**	
Residual Risk Level:			**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely** / **Worst Case**	
Residual Schedule Impact:			
Impacted Scope of Work:			

Risk / Opportunity Assessment Form

ID Number: 082 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 083 **Revision:** 03 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: DWPF Processing Impacted by FBSR Product			
Type: **Risk** Internal Technical	**Category:** SRR		
Assess. Element: 1.3	**Title:** Transfer Product to Receipt Tank		
Responsible Org: SRR-ENG - Engineering	**Contact:** Steve Brown	**Date Identified:** 14-Feb-07	
Statement of Event: The current baseline design is based on producing a product that can be slurried and sent to DWPF via the receipt tank. Pilot testing indicates that the product stream will contain carbon particles that are undesirable in the DWPF feed stream.			
Likelihood:	Likely	**Basis:** Based on the Hazen pilot testing which showed carbon fines in the product stream from approximately 12-15 wt% (Vs DWPF WAC limit of 0.24%)	
Consequence / Benefit:	N/A	**Basis:** If this risk is realized, there will be no impact to the TTP Project. FBSR deployment will proceed, however, a Program impact will have been realized and strategies will have to be developed to process the tank contents and minimize the impact to DWPF operations.	
Most Significant Cost Impact ($k): N/A	**Most Significant Schedule Impact:** N/A		
Level:		**Event Trigger:** Upon finalizing FBSR flowsheet, the wasteform coming out of FBSR is determined to be unacceptable for DWPF processing.	
Handling Strategy:	Mitigate	**Description:** The TTP Project will perform the following to assist mitigation of Program impacts: evaluate process for FBSR output in the final product stream; develop modeling for sludge batch with FBSR output; and require the vendor to perform elutriation and carryover calculations. (Reference PBS-SR-0014 Risks 034, 048, 083, 120 and 145).	
Handling Strategy Action Items: 083-2 Evaluate process for FBSR output in the final product stream., , , Steve Brown, 083-3 Develop modeling for sludge batch with FBSR output., , , Steve Brown, 083-5 Vendor to perform elutriation and carryover calculations., , , Sergio Mazul,			
HS Implementation Cost ($K):	0	**Basis:** No additional cost to project baseline.	
HS Implementation Schedule:	0	**Basis:** Perform as part of the already scheduled preliminary design.	
Other Handling Strategies:			
Statement of Residual Risk: None, this is not a Project risk			
Residual Likelihood:		**Basis:**	
Residual Consequence:		**Basis:**	
Residual Risk Level:			**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely** / **Worst Case**	
Residual Schedule Impact:			
Impacted Scope of Work:			
Evaluation Comments:			
Event Comments: Reference Program Risks 034, 048, 083, 120 and 145 within PBS-SR-0014 ROMP (Y-RAR-G-00022, Revision 6).			

Risk / Opportunity Assessment Form

ID Number: 085 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Maintenance Requires Remote Operations

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 4.0 | **Title:** Safety In Design

Responsible Org: SRR-DS - Design Services | **Contact:** Sergio Mazul | **Date Identified:** 28-Feb-07

Statement of Event: The current design is based on a maintenance strategy that does not require remote operation provisions to maintain distance and shielding. System draining and flushing have been assumed adequate for decontamination prior to maintenance. It is determined that lowering of radiation rates to a suitable level for maintenance cannot be achieved by draining and flushing.

Likelihood:	Likely	**Basis:** All items requiring maintenance have not been identified at this time.
Consequence / Benefit:	Crisis	**Basis:** Schedule delay and cost to design and install features that provide for remote maintenance (up to and including an automated maintenance vehicle).

Most Significant Cost Impact ($k): 5,000 | **Most Significant Schedule Impact:** 6 Mths

Level:	**High**	**Event Trigger:** FBSR system design and maintainability requirements definition phase, MSA/ORR, Hot Operations.
Handling Strategy:	Mitigate	**Description:** During design, assure all items requiring maintenance are designed and located for easy access, removal and replacement to reduce maintenance time. Vendor is required to provide input to shielding calcs. Where possible provide shielding portals for access and rigging/hoisting points that take advantage of available distance and shielding. Determine if any equipment bails, hoist attachments, or camera views would be beneficial for some equipment maintenance activities. SRR operations and maintenance will be engaged with vendor in developing design features to allow cleaning to minimize dose.

Handling Strategy Action Items:

085-10 Conduct a TTT/SRR meeting to discuss assumptions used for dose calculations, , , John Contardi,

085-11 Re-evaluate projected scale thickness and composition (Brad Mason/Henkel)., , , John Contardi,

085-12 Develop remote strategy document and submit to SRR for review and approvel (TTT)., , , John Contardi,

085-13 Update RAMI to support evaluation for need for remote tooling and annual maintenance outage strategy. (Bourgeois), , , Sergio Mazul,

085-14 Evaluate the cost effectiveness of automated remote tooling and recommend path forward on further development of automated remote tooling., , , John Contardi,

085-15 Evaluate DMR & PSF decontamination approaches and develop DMR decontamination procedure., , , Steve Brown,

085-4 Assure all items requiring maintenance are identified., , , Sergio Mazul,

085-5 Assure that the FBSR system design provides for easy access, minimal shielding removal, shielding port provisions, equipment removal and the means for replacement., , , Sergio Mazul,

085-6 Determine the maximum weight that can be handled by the existing monorail in the facility., , , Sergio Mazul,

085-8 Determine early in design what rad rates can be expected after draining, flushing and ventilation., , , Ken Fleming,

085-9 Utilize 3-D model to assure all items requiring maintenance are identified., , , Sergio Mazul,

HS Implementation Cost ($K):	16	**Basis:** Additional $16,000 will be provided to perform the monorail analysis study and the rad rate study (160 mhrs).
HS Implementation Schedule:	0	**Basis:** This activity wil be performed in parallel with vendor design activity and no project contingency or extension should be required.

Other Handling Strategies:

Statement of Residual Risk: Residual risk remains that remotability aspects will not be achieved without more control tools, vision, and overhead crane/hoist.

Residual Likelihood:	Likely	**Basis:** Likelihood has been reduced slightly by implementation of action items.
Residual Consequence:	Crisis	**Basis:** Schedule delay and additional cost

Risk / Opportunity Assessment Form

ID Number: 085 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Residual Risk Level:	**High**			**Residual Impact Basis:** Worst Case: Schedule delay and additional cost up to and including an automated maintenance vehicle. Most L kely Case: Schedule delay and additional cost Best Case: Schedule delay and additional cost
Residual Cost Impact ($K):	**Best Case** 300	**Most Likely** 600	**Worst Case** 2000	
Residual Schedule Impact:	1 Mth	2 Mths	4 Mths	

Impacted Scope of Work: FBSR system design/fab and 241-96H support systems needed for any remotability equipment operation.

Evaluation Comments:

Event Comments: Reference TTT Risks #FBSR 6 and FBSR 13.

Risk / Opportunity Assessment Form

ID Number: 087 **Revision:** 03 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: High Silica Content Creates a Processing Problem at 2H Evaporator

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 1.3 | **Title:** Transfer Product to Receipt Tank

Responsible Org: SRR-ENG - Engineering | **Contact:** Steve Brown | **Date Identified:** 26-Mar-07

Statement of Event: Preliminary results from Hazen Pilot Scale testing identified the potential to have high soluble silica (>1300 g/L) in the Tank Farm receipt tank. This content is much higher than anything processed to date in the 2H evaporator system which could cause significant scale build up in the evaporator at a faster rate. Even if material is sent to DWPF there is concern that the recycle returned to the 2H systems will be significantly higher in soluble silica.

Likelihood:	Likely	**Basis:** SRNL evaluation on solids from Hazen Pilot scale testing showed that soluble silica in water is ~ 230 mg/L which could be even higher in alkaline environment of waste tank.
Consequence / Benefit:	N/A	**Basis:** If this risk is realized, there will be no impact to the TTP Project. FBSR deployment will proceed, however, a Program impact will have been realized and strategies will have to be developed to process the tank contents and minimize the impact to 2H Evaporator operations.

Most Significant Cost Impact ($k): N/A | **Most Significant Schedule Impact:** N/A

Level:		**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** The TTP Project will perform the following to assist mitigation of Program impacts: perform evaluation to determine soluble silica expected in the Tank Farm receipt tank; evaluate impact to 2H evaporator system and determine is additional action is required to reduce/remove silica. (Reference PBS-SR-0014 Risks 116 and 367).

Handling Strategy Action Items:

087-1 Perform evaluation/test to determine soluble silica expected in the Tank Farm receipt tank., , , Steve Brown,

087-2 Evaluate impact to 2H evaporator system and determine if additional action is required to reduce/remove silica., , , Skip Wiggins,

HS Implementation Cost ($K):	0	**Basis:** Within existing cost baseline.
HS Implementation Schedule:	0	**Basis:** No impact to schedule baseline.

Other Handling Strategies:

Statement of Residual Risk: None, this is not a Project risk.

Residual Likelihood:		**Basis:**		
Residual Consequence:		**Basis:**		
Residual Risk Level:				**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact:	0	0	0	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 093 **Revision:** 03 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Accident Analysis Determines Additional Safety Controls are Required

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 4.0 | **Title:** Safety In Design

Responsible Org: SRR-DA - Design Authority | **Contact:** Steve Hall | **Date Identified:** 16-Jun-08

Statement of Event: A preliminary CHAP has been issued for the FBSR. A risk exists that when updating the CHAP a need is identified to include additional safety controls in the design.

Likelihood:	Unl kely	**Basis:** PCHAP has been issued.
Consequence / Benefit:	Critical	**Basis:** The worst case would be that controls are required. This redesign and additional fabrication requirements would increase the cost of the project and incur a schedule impact.

Most Significant Cost Impact ($k): 500 | **Most Significant Schedule Impact:** 3 Mths

Level:	**Moderate**	**Event Trigger:** Currently open; Close upon completion of CHAP.
Handling Strategy:	Mitigate	**Description:** Specify materials as Quality Level 2 (equivalent to SS) during initial procurement to allow early procurement and avoid schedule delays. Pursue testing of DMR and PSF coal/product for combustion.

Handling Strategy Action Items:

093-1 Specify materials as Quality Level 2 (equivalent to SS) during initial procurement to allow early procurement and avoid schedule delays., , , Sergio Mazul,

093-2 Pursue testing of DMR and PSF coal/product for combustion. (complete), , , Gerry Eide,

HS Implementation Cost ($K):	0	**Basis:** Within current cost baseline.
HS Implementation Schedule:	0	**Basis:** No impact on schedule baseline.

Other Handling Strategies:

Statement of Residual Risk: A risk remains that when updating the CHAP a need is identified to include additional safety controls in the design.

Residual Likelihood:	Unl kely	**Basis:** PCHAP has been issued, however additional scenarios of coal dust explosion events are being analyzed.
Residual Consequence:	Significant	**Basis:** Controls are required to combat coal dust hazards. These include: interlocks on dry material feed systems, safety significant PSF vessel etc. This redesign and additional fabrication requirements increases cost and incurs a schedule impact.

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** All Cases: Additional controls are required.
Residual Cost Impact ($K):	**Best Case** 500	**Most Likely** 500	**Worst Case** 500	
Residual Schedule Impact:	2 Wks	3 Wks	4 Wks	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 095 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Accumulation of Solids in WFT, PDT, and/or PST

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 4.0 | **Title:** Safety In Design

Responsible Org: SRR-ENG - Engineering | **Contact:** Steve Brown | **Date Identified:** 16-Jun-08

Statement of Event: A slurry will be transferred from Tank 48 to the WFT. The WFT will be agitated to suspend the solids. The DMR will generate a solid carbonate product will be dissolved in the PDT. Water will be utilized to dissolve the soluble carbonate compounds in the product. Insoluble oxide compounds will be transferred as insoluble particles to the PST. The PST will be agitated to suspend insoluble particles. Insoluble solids accumulate in the WFT, PDT, and/or PST.

Likelihood:	Likely	**Basis:** Solids are present in the T48 slurry and when the DMR product was dissolved during ESTD Testing insoluable solids were present.
Consequence / Benefit:	Significant	**Basis:** Solids will be present in the WFT, PST, & PDT. Lack of agitation will cause solids to settle out and resuspension of the solids may not be probable resulting in solids accumulation. Solids may then prevent transfer. Agitator would have to be replaced, including jumper.

Most Significant Cost Impact ($k): 1000 | **Most Significant Schedule Impact:** 1 Mth

Level:	**Moderate**	**Event Trigger:**
Handling Strategy:	Avoid	**Description:** Use mixing/agitation to suspend the insoluble and designing transfer systems capable of transferring slurried solutions will avoid this risk.

Handling Strategy Action Items:

095-1 Perform evaluations to ensure that the WFT and PST agitators are capable of maintaining insoluable solids in suspension and capable of resuspending the insoluble solids., , , Sergio Mazul,

095-2 Perform evaluations to ensure that the PST is capable of maintaining insoluable solids in suspension and capable of resuspending the insoluble solids., , , Sergio Mazul,

095-3 Ensure through design that the WFT & PST pumps are capable of transferring the slurried material., , , Sergio Mazul,

095-4 Ensure that radiological calculations take into account a suspended slurry, as well as a settled slurry., , , Ken Fleming,

HS Implementation Cost ($K):	0	**Basis:** Cost is within existing baseline.
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies:

Statement of Residual Risk: Risk has been avoided.

Residual Likelihood:		**Basis:**		
Residual Consequence:		**Basis:**		
Residual Risk Level:				**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact:	0	0	0	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 098 **Revision:** 03 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: Sampling System Does not Perform as Designed

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 4.0 | **Title:** Safety In Design

Responsible Org: SRR-DS - Design Services | **Contact:** Sergio Mazul | **Date Identified:** 15-Apr-09

Statement of Event: The FBSR feed and product streams are composed of a slurry of liquids and solids. A risk exists that, when designed, the FBSR sampling system requires extensive troubleshooting/modifications during startup and operations.

Likelihood:	Likely	**Basis:** Tank Farm previous experience with "flow through" type samplers has proven that troubleshooting is required.
Consequence / Benefit:	Crisis	**Basis:** The sampling system will be unable to demonstrate compliance with the Tank Farm and downstream facilities receipt criteria. Extensive modifications will result in additional cost and schedule delays. Worst case would be 2 new samplers. Cost and schedule impact.

Most Significant Cost Impact ($k): 500 | **Most Significant Schedule Impact:** 4 Mths

Level:	**High**	**Event Trigger:**
Handling Strategy:	Avoid	**Description:** Revise the current Sampling Strategy for the FBSR system (Ref. LWO-SPT-2008-00116) to confirm sampling needs for the FBSR system and tank farm receipt tank early in the preliminary design phase. Prepare a Sampling Plan, obtain concurrence from operations and incorporate into the projects TR&C. During the sampling design development ensure buy in from maintenance and operations. Risk is avoided.

Handling Strategy Action Items:

098-1 Identify and Define sample points early for the FBSR system within an approved sampling plan. (complete), , , Steve Brown,
098-2 Issue a revised TR&C to provide sampling design input. (complete), , , Steve Hall,
098-3 Revise SOW to identify specific sampling point locations on the FBSR., , , Steve Hall,
098-4 Determine Sampler Unit(s) location and confinement requirements. (complete), , , Steve Hall,
098-5 Design a new Sampler for every stream., , , Sergio Mazul,
098-6 Design Sampler(s) for maintenance access easy assembly/disassembly., , , Sergio Mazul,
098-8 Review lessons learned from previous Tank Farm sampler applications and incorporate into design., , , Sergio Mazul,

HS Implementation Cost ($K):	0	**Basis:** Within current cost baseline.
HS Implementation Schedule:	0	**Basis:** No impact to schedule baseline.

Other Handling Strategies:

Statement of Residual Risk: Risk has been avoided.

Residual Likelihood:		**Basis:**		
Residual Consequence:		**Basis:**		
Residual Risk Level:				**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact:	0	0	0	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 100 **Revision:** 02 **Last Date Evaluated:** 4-Oct-10 **Status:** Active

Event Title: WFT and PST Cooling is Inadequate

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 4.0 | **Title:** Safety In Design

Responsible Org: SRR-DS - Design Services | **Contact:** Sergio Mazul | **Date Identified:** 15-Apr-09

Statement of Event: WFT temperature required to be kept <35C to minimize benzene generation, PST temperature limits required to meet HTF requirements. A risk exists that the existing tank cooling is inadequate to maintain required temperatures resulting in extended material residence time in tanks, impacting facility attainment.

Likelihood:	Unl kely	**Basis:** These 2 tanks are currently in use by ARP. Cooling is currently in use on both tanks and is adequate for temperature service comparable to future FBSR needs. Design of present cooling has significant spare capacity, however, grinder will introduce heat into the system.
Consequence / Benefit:	Significant	**Basis:** Failure to achieve attainment will result in a longer processing period for Tank 48 contents. If detected during testing and cold runs it would result in a delay to Project completion and additional cost for design of control system.

Most Significant Cost Impact ($k): 200 | **Most Significant Schedule Impact:** 1 Mth

Level:	**Moderate**	**Event Trigger:**
Handling Strategy:	Avoid	**Description:** Perform analysis during preliminary design to confirm adequacy of tank cooling capacity and cooling control system.

Handling Strategy Action Items:

100-1 Update analysis during final design to confirm adequacy of tank cooling capacity and cooling control system (to include the impacts of auger grinder heat generation)., , , Sergio Mazul,

HS Implementation Cost ($K):	0	**Basis:** Within current project cost baseline.
HS Implementation Schedule:	0	**Basis:** No impact to project baseline schedule.

Other Handling Strategies:

Statement of Residual Risk: Risk is avoided by design of cooling capacity.

Residual Likelihood:		**Basis:**		
Residual Consequence:		**Basis:**		
Residual Risk Level:				**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact:	0	0	0	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 102 **Revision:** 03 **Last Date Evaluated:** 6-Oct-10 **Status:** Active

Event Title: DWPF Particle Size Requirements Not Met

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 1.3 | **Title:** Transfer Product to Receipt Tank

Responsible Org: SRR-DS - Design Services | **Contact:** Sergio Mazul | **Date Identified:** 15-Apr-09

Statement of Event: DWPF WAC (X-SD-G-00008, 5.4.15) requires that new product streams into DWPF have maximum particle size of 80 mesh seive. A risk exists that a methodology cannot be found to reduce particle size to comply with WAC, making product unacceptable as feed to DWPF.

Likelihood:	Likely	**Basis:** Grinder vendor demonstrations showed product can be size reduced but had product sizes greater than 80 mesh. 100% size criteria is difficult to meet.
Consequence / Benefit:	Crisis	**Basis:** A new unit operation will have to be designed and installed to reduce solid product to comply with WAC. After installation, the process will be restarted. Cost of design, procurement, installation, testing of new unit operation.

Most Significant Cost Impact ($k): 1000 | **Most Significant Schedule Impact:** 6 Mths

Level:	**High**	**Event Trigger:** During design and testing it is determined that DWPF particle size limitations cannot be met with the current configuration.
Handling Strategy:	Mitigate	**Description:** Refine data on expected bauxite concentration, perform additional testing and develop a path forward early in project.

Handling Strategy Action Items:

102-1 Determine how much bauxite can be expected using analysis from Phase III ESTD testing., , , Tim Baughman,
102-2 Define grinder testing requirements (including durability testing)., , , Steve Hall,
102-3 Stage grinder equipment and perform testing., , , Steve Hall,
102-5 Revise 100% size requirement from DWPF WAC., , , Steve Brown,
102-6 Evaluate the use of a Y-Gate strainer to allow out of specification material to be drummed., , , Steve Brown,
102-7 Develop a path forward for particle size reduction., , , Tim Baughman,
102-8 Evaluate the replacement of the CRR with a thermal oxidizer, , , John Contardi,

HS Implementation Cost ($K):	500	**Basis:** Cost for additional testing and evaluation.
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies:

Statement of Residual Risk: A risk remains that partical size does not comply with DWPF WAC.

Residual Likelihood:	Unl kely	**Basis:** Likelihood has been reduced by incorporating testing results and evaluation findings into FBSR design.
Residual Consequence:	Crisis	**Basis:** Major unit operation must be added to the process, cost and schedule impact.

Residual Risk Level:	**High**			**Residual Impact Basis:** Worst Case: Major unit operation must be added to the process, cost and schedule impact. Most L kely Case: Unit operation must be added to the process, cost and schedule impact. Best Case: Minor unit operation must be added to the process, cost and schedule impact.
Residual Cost Impact ($K):	**Best Case** 300	**Most Likely** 500	**Worst Case** 1000	
Residual Schedule Impact:	2 Mths	3 Mths	6 Mths	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: Reference TTT Risk # FBSR 36.

Risk / Opportunity Assessment Form

ID Number: 103 **Revision:** 03 **Last Date Evaluated:** 6-Oct-10 **Status:** Active

Event Title: Doorstops Are Not Available As Needed to Support Sampling Activities

Type: **Risk** Internal Programmatic | **Category:** SRR

Assess. Element: 1.0 | **Title:** Processing

Responsible Org: SRR-ENG - Engineering | **Contact:** Steve Brown | **Date Identified:** 15-Apr-09

Statement of Event: After samples are taken, they will be housed in "Door Stops" for transportation. A risk exists that there are not sufficient doorstops available to support sampling needs and additional doorstops will have to be procured by the project.

Likelihood:	Likely	**Basis:** LWO is now limited to the available supplies of Door Stops within LWO. Doorstops owned by SRNS would likely have to be purchased at additional expense.
Consequence / Benefit:	Critical	**Basis:** The worst case would be that all 20 (estimated) doorstops would have to be purchased at a cost of $40K each. Procurement/Fabrication of doorstops will be a long lead item.

Most Significant Cost Impact ($k): 800 | **Most Significant Schedule Impact:** 3 Mths

Level:	**High**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Perform identification of spare doorstops at SRS. Perform radiological dose estimate/calculation to determine shielding requirements for samples. Determine if the doorstops identified meet the radiological requirements. In parallel initiate Procurement Process to purchase acceptable spares identified from SRNS and initiate Procurement Process for fabrication of remainder of doorstops.

Handling Strategy Action Items:

103-1 Perform radiological dose estimate/calculation to determine shielding requirements for samples., , , Ken Fleming,
103-2 Determine if the doorstops identified meet the radiological requirements., , , Ken Fleming,
103-3 Ensure that shielded door stops are identifed on long lead procurement list., , , Steve Hall,

HS Implementation Cost ($K):	22	**Basis:** 40 hrs Operations to research and identify. 20 hrs RCO to perform radiological dose estimate/calculation. 80 hrs Design Engineering to write specification. 40 hrs Design Authority to review specification and radiological dose estimate/calculation. 40 hrs Procurement for procurement set up.
HS Implementation Schedule:	0	**Basis:** Work RCO and Operations in parallel, off critical path.

Other Handling Strategies:

Statement of Residual Risk: Doorstops may stiil be in short supply.

Residual Likelihood:	Likely	**Basis:** Very Unlikely that 20 spare doorstops will be found on site. Assume that 10 are located that are acceptable per the radiological dose estimate/calculation.
Residual Consequence:	Marginal	**Basis:** Delay and cost. (cost from SRNS $10K per) (cost for new $20K per)

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Best Case: 20 acceptable doorstops are found on site. Most L kely Case: 10 acceptable doorstops are found onsite. Worst Case: 0 acceptable doorstops are found onsite.
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	
	0	600	800	
Residual Schedule Impact:	0	2 Mths	3 Mths	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 104 **Revision:** 02 **Last Date Evaluated:** 6-Oct-10 **Status:** Active

Event Title: SCDHEC Permitting Engineering Resources Are Not Available

Type: **Risk** External Programmatic | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-ENV - Environmental | **Contact:** Rm Campbell | **Date Identified:** 5-May-09

Statement of Event: Permits must be approved by SCDHEC to allow implementation of TTP. A risk exists that SCDHEC may not be able to provide necessary permits/approvals due to lack of manpower.

Likelihood:	Likely	**Basis:** The SCDHEC Federal Facility Liaison has publicly stated regulatory support for SRS activities remain a high priority within the agency. SCDHEC has supported permit schedule in the past, however, South Carolina's budget shortfall directly impacts SCDHEC Environmental Compliance staff and SCDHEC personnel have been advised of management's decision to enforce a five-day furlough as a cost savings measure.
Consequence / Benefit:	Significant	**Basis:** Delay in obtaining permits will result in schedule impacts.

Most Significant Cost Impact ($k): 0 | **Most Significant Schedule Impact:** 6 Wks

Level:	**Moderate**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Actively engage SCDHEC in permitting process through information meetings, site visits, etc. Ensure local SCDHEC office is involved in discussions with SCDHEC permit engineer in Columbia. Ensure all braches of SCDHEC are involved during permit discussions.

Handling Strategy Action Items:

104-1 Actively engage SCDHEC in permitting process at beginning of Tank 48 project through information meetings, site visits, etc., , , Rm Campbell,

104-2 Ensure local SCDHEC office is involved in discussions with SCDHEC permit engineer in Columbia and all branches of SCDHEC are involved during permit discussions., , , Rm Campbell,

HS Implementation Cost ($K):	0	**Basis:** Handling strategy is part of normal communications and therefore no additional costs are incurred.
HS Implementation Schedule:	0	**Basis:** Handling strategy is part of normal communications and no schedule impacts are incurred.

Other Handling Strategies:

Statement of Residual Risk: Even with advance planning and coordination with SCDHEC, delay in obtaining permits and schedule impacts can still occur.

Residual Likelihood:	Unl kely	**Basis:** Likelihood has been reduced slightly, but not to very unlikely.
Residual Consequence:	Significant	**Basis:** Impact has been reduced by advance planning and coordination with SCDHEC, however, delay in obtaining permits and schedule impacts can still occur.

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: Delay in obtaining permits and schedule impact. Most L kely Case: Some delay in obtaining permits and some schedule impact. Best Case: Minor delay in obtaining permits and minor schedule impact.
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact:	1 Wk	2 Wks	4 Wks	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 108 **Revision:** 01 **Last Date Evaluated:** 12-Oct-10 **Status:** Active

Event Title: SCDHEC IWT Construction Permit Issuance Is Delayed

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: - | **Contact:** Don McWhorter | **Date Identified:** 18-Dec-09

Statement of Event: Currently it is assumed that the Industrial Wastewater Treatment (IWT) construction Permit will be approved by SCDHEC for TTP deployment. A risk exists that the permit issuance is not accepted and delayed by SCDHEC. The project will have to revise and re-submit the permit package for SCDHEC approval. This will delay CD-3 and construction will not begun until a permit is obtained.

Likelihood:	Likely	**Basis:** Current assumption that IWT construction permit will be approved by SCDHEC is based Hazen engineering scale testing, and inputs for a full-scale unit are not available to verify the assumption. A risk exist for the full-scale unit not meet the SCDHEC requirements for an IWT construction permit approval.
Consequence / Benefit:	Crisis	**Basis:** A delay to the project schedule will occur while the permit package and application is revised and re-submitted and subsequently re-reviewed and approved by SCDHEC. A worse case is estimated at 6 mths. An additional cost of 200K.

Most Significant Cost Impact ($k): 200 | **Most Significant Schedule Impact:** 6 Mths

Level:	**High**	**Event Trigger:** After submittal of IWT construction permit for approval by SCDHEC this risk could occur. After issuance of IWT construction permit, this risk can no longer occur.
Handling Strategy:	Mitigate	**Description:** Develop input data and permit package to ensure it will comply the SCDHEC requirements for a construction permit application.

Handling Strategy Action Items:

108-1 Include specific direction to vendor to develop data and inputs for IWT permit package to ensure it will meet the regulatory requirements., , , Sergio Mazul,

108-2 Review data and inputs to ensure SCDHEC requirements for a permit application are met, , , Chris Johnson,

HS Implementation Cost ($K):	0	**Basis:** The cost for preparing the permit package is already in the baseline cost estimate.
HS Implementation Schedule:	0	**Basis:** The schedule for preparing this permit package can be brought forward without impacting the overall schedule.

Other Handling Strategies:

Statement of Residual Risk: Permit package may still be determined not adequate to meet SCDHEC requirements, and permit package and application is revised and re-submitted, however, the schedule delay has been avoided by performing the determination early.

Residual Likelihood:	Likely	**Basis:** Current information from the Hazen testing indicates the IWT construction permit package for a full-scale unit will meet the SCDHEC requirements.
Residual Consequence:	Critical	**Basis:** Cost to revise and re-submit a IWT construction permit.

Residual Risk Level:	**High**			**Residual Impact Basis:** Additional cost of revising and re-submitting a IWT construction permit package (Best Case: 1 mths schedule and $50k cost; Most Likely: 2 mths and $50k; Worst Case: 3 mths and $50k).
Residual Cost Impact ($K):	**Best Case** 50	**Most Likely** 50	**Worst Case** 50	
Residual Schedule Impact:	1 Mth	2 Mths	3 Mths	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 109 **Revision:** 01 **Last Date Evaluated:** 11-Oct-10 **Status:** Active

Event Title: Non-Rad (SCDHEC-BAQ (Bureau of Air Quality) Construction Permit is Delayed

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: - | **Contact:** Don McWhorter | **Date Identified:** 18-Dec-09

Statement of Event: Currently it is assumed that the non-rad construction Permit will be approved by SCDHEC for TTP deployment. A risk exists that when the calculated non-rad emmissions are finalized, there is a threshold limitation that has been exceeded. The project will have to include mitigating modifications to meet the threshhold limits and re-develop the permit application. This will delay CD-3 and construction not begun until a permit is obtained.

Likelihood:	Likely	**Basis:** Current information from Hazen (2006 Hazen testing) indicates the particulate matter (PM) threshold may be exceeded with a full-scale unit based on Phase 2/3 testing.
Consequence / Benefit:	Crisis	**Basis:** A delay to the project schedule will occur to design and incorporate mitigating modifications, resubmit permit application by SRR and subsequently reviewed and approved by SCDHEC. A worse case is estimated at 6 mths. An additional cost of 250K.

Most Significant Cost Impact ($k): 50 | **Most Significant Schedule Impact:** 6 Mths

Level:	**High**	**Event Trigger:** Risk may occur after submittal of non-rad construction permi to SCDHEC. Risk will not occur after non-rad construction permit has been approved.
Handling Strategy:	Mitigate	**Description:** Develop data and perform calculation to determine emission levels of unit in sufficient time to incorporate mitigating modifications in design to ensure permit thresholds will not be exceeded.

Handling Strategy Action Items:

109.3 Review inputs and perform non-rad air emission calculation to ensure PM threshold limit is met., , , Chris Johnson,

109-1 Include specific direction to vendor to develop data for non-rad air emissions calculation input to ensure the design will meet the regulatory threshold limit for PM., , , Sergio Mazul,

HS Implementation Cost ($K):	0	**Basis:** The cost for performing this evaluation is already in the baseline cost estimate.
HS Implementation Schedule:	0	**Basis:** The schedule for performing this evaluation can be brought forward without impacting the overall schedule.

Other Handling Strategies:

Statement of Residual Risk: Design may still be determined not adequate to meet PM threshold limit, permit application is revised and re-submitted, and modifications are required to maitain process operation below the threshold limits, however, the schedule delay has been avoide by performing the determination early.

Residual Likelihood:	Likely	**Basis:** Current information from Hazen (2006 Hazen testing) indicates the particulate matter (PM) threshold may be exceeded with a full-scale unit based on Phase 2/3 test data.
Residual Consequence:	Negligible	**Basis:** Cost to develop and submit a non-Rad construction permit.

Residual Risk Level:	**Low**			**Residual Impact Basis:** All cases: no schedule impact, but additional cost of preparing and submitting a non-Rad BAQ construction permit request, and cost of modifications (modofications: Worst Case - $50k; Most Likely - $25k; Best case – $10k)
Residual Cost Impact ($K):	**Best Case** 10	**Most Likely** 25	**Worst Case** 50	
Residual Schedule Impact:	0	0	0	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 111 **Revision:** 01 **Last Date Evaluated:** 11-Oct-10 **Status:** Active

Event Title: Design Changes are Required to Achieve Performance Goals

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 4.0 | **Title:** Safety In Design

Responsible Org: SRR-DA - Design Authority | **Contact:** Chris Johnson | **Date Identified:** 18-Dec-09

Statement of Event: As design matures, analysis indicates operational events which result in consequences determined by management to be unacceptable for recovery timeframe, cost, and/or personnel exposure. Examples may include process upsets which cause necessary removal of the DMR and/or CRR bed material. It may be desirable to reduce the risk of these operational events with increased equipment reliability and/or redundancy. This results in additional scope and cost.

Likelihood:	Likely	**Basis:** Pilot plant testing demonstrated importance of steam system reliability to avoiding unplanned process upsets that could result in unacceptable time, cost and exposure conditions when radioactive operations commence. Other systems may include nitrogen and ventilation.
Consequence / Benefit:	Critical	**Basis:** If this risk is realized a scope could be added to the project which may include designing support systems with additional redundancies. Cost and schedule delays.

Most Significant Cost Impact ($k): 500 | **Most Significant Schedule Impact:** 3 Mths

Level:	**High**	**Event Trigger:** Additional scope will not be added after the completion of CD-2 estimate as the design will be mature enough to close this risk.
Handling Strategy:	Mitigate	**Description:** Request information from TTT on process upsets and impacts to operational recovery. Perform evaluations of site equipment reliability and provide recommendations to management. The residual risk would be an operational vulnerability if the controls/redundancies either cannot be provided or do not fully resolve the problem.

Handling Strategy Action Items:

111-1 Develop and submit questions to TTT, , , Gerry Eide,

111-2 Evaluate support systems and evaluate the process response to loss of support system events during preliminary and final design to ensure process control design supports acceptable recovery from loss of support system events., , , Steve Hall,

111-3 Document recommendations in path forward/white paper., , , Steve Hall,

111-4 Evaluate upset condition report (from vendor-SOW Section 3.3.9.5.E), , , Steve Hall,

111-5 Advise project management if actions 3 or 4 concludes that the process controls cannot be designed to avoid unacceptable recovery conditions., , , Steve Hall,

HS Implementation Cost ($K):	0	**Basis:** Handling strategy is part of the existing baseline. No additional costs are incurred.
HS Implementation Schedule:	0	**Basis:** No impact to the current schedule baseline.

Other Handling Strategies:

Statement of Residual Risk: The residual risk would be an operational vulnerability if the controls/redundancies either cannot be provided or do not fully resolve the problem.

Residual Likelihood:		**Basis:**		
Residual Consequence:		**Basis:**		
Residual Risk Level:				**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	
Residual Schedule Impact:				

Impacted Scope of Work:

Risk / Opportunity Assessment Form

ID Number: 111 **Revision:** 01 **Last Date Evaluated:** 11-Oct-10 **Status:** Active

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 112 **Revision:** 01 **Last Date Evaluated:** 11-Oct-10 **Status:** Active

Event Title: During Startup Additional Samples Are Required

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 1.0 | **Title:** Processing

Responsible Org: SRR-ENG - Engineering | **Contact:** Steve Brown | **Date Identified:** 18-Dec-09

Statement of Event: The PDT solution must be characterized to ensure downstream compliance. The PDT product composition characterization baseline is planned to be based on 7 sample & hold samples. A risk exists that additional samples are required to validate the process during startup.

Likelihood:	Likely	**Basis:** Typically 20 sample and hold samples are required to establish a process characterization baseline.
Consequence / Benefit:	Crisis	**Basis:** The worst case consequence would result in up to 30 week delay with an additional cost of $100K.

Most Significant Cost Impact ($k): 100 | **Most Significant Schedule Impact:** 30 Wks

Level:	**High**	**Event Trigger:** Risk may be realized upon startup of facility. After turnover to operations risk is closed. For operational vulnerability refer to risk 003.
Handling Strategy:	Mitigate	**Description:** Evaluate statistically the need for more than 7 samples based on previous operational experience with MCU. Develop additional capabilities in F-Area Lab.

Handling Strategy Action Items:

112-1 Evaluate statistically the need for more than 7 samples based on previous operational experience with MCU., , , Steve Brown,

112-2 Evaluate F-Lab (772-F) and/or DWPF Lab capability to process FBSR samples., , , Steve Brown,

HS Implementation Cost ($K):	TBD	**Basis:** Developing F-Lab capabilities may be funded by other than this project.
HS Implementation Schedule:	0	**Basis:** Within current baseline schedule.

Other Handling Strategies:

Statement of Residual Risk: A risk remains that additional samples may be required.

Residual Likelihood:	Likely	**Basis:** It remains as likely that additional samples are required.
Residual Consequence:	Significant	**Basis:** 20 samples are required, some schedule relief is gained by using F-Area Lab

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst case: 20 samples are required, some schedule relief is gained by using F-Area Lab Most L kely Case: Additional samples are required some relief using F-Area Lab Best Case: Some additional samples required and F-Area Lab can accommodate their analysis.
Residual Cost Impact ($K):	**Best Case** 25	**Most Likely** 50	**Worst Case** 100	
Residual Schedule Impact:	0	1Mths	2 Mths	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

Risk / Opportunity Assessment Form

ID Number: 117 **Revision:** 01 **Last Date Evaluated:** 12-Oct-10 **Status:** Active

Event Title: Additional Project Reviews are Required

Type: **Risk** External Programmatic | **Category:** DOE

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PM - Project Manager | **Contact:** Jon Lunn | **Date Identified:** 2-Jun-10

Statement of Event: The TTP Project schedule has activities built in for the project reviews normally associated with a capital asset project under DOE O 413.3A. A risk exists that additional revews/hold points are imposed (e.g. by DOE-HQ, OECM etc).

Likelihood:	Likely	**Basis:** This is l kely due to the TTP Project being a high vis bility project within DOE.
Consequence / Benefit:	Critical	**Basis:** Assuming three additional reviews each impacting the project schedule by up to one month with an additional cost of $100K to support each review.

Most Significant Cost Impact ($k): 300 | **Most Significant Schedule Impact:** 3 Mths

Level:	**High**	**Event Trigger:** Currently open; Closed upon completion of ORR.
Handling Strategy:	Accept	**Description:** There is no effective handling strategy that can be employed to mitigate this risk. It is outside the control of the Project Team. If this risk is realized, a BCP will be developed to obtain additional funding from DOE contingency.

Handling Strategy Action Items:

HS Implementation Cost ($K):		**Basis:**
HS Implementation Schedule:		**Basis:**

Other Handling Strategies:

Statement of Residual Risk: A risk remains that additional reviews may be imposed by the DOE. If this risk is realized, a BCP will be developed to obtain additional funding from DOE contingency.

Residual Likelihood:	Likely	**Basis:** This is l kely due to the TTP Project being a high vis bility project within DOE.
Residual Consequence:	Critical	**Basis:** Three additional reviews each impacting the project schedule by up to one month with an additional cost of $100K to support each review.

Residual Risk Level:	**High**			**Residual Impact Basis:** Worst Case: Three additional reviews each impacting the project schedule by up to one month with an additional cost of $100K to support each review. Most L kely Case: Two additional reviews each impacting the project schedule by up to one month with an additional cost of $100K to support each review. Best Case: One additional review impacting the project schedule by up to one month with an additional cost of $100K.
Residual Cost Impact ($K):	**Best Case** 100	**Most Likely** 200	**Worst Case** 300	
Residual Schedule Impact:	1 Mth	2 Mths	3 Mths	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: If this risk is realized, a BCP will be developed to obtain additional funding from DOE contingency.

Risk / Opportunity Assessment Form

ID Number: 118 **Revision:** 01 **Last Date Evaluated:** 12-Oct-10 **Status:** Active

Event Title: Legacy Costs Increase

Type: **Risk** External Programmatic | **Category:** DOE

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PM - Project Manager | **Contact:** Jon Lunn | **Date Identified:** 10-Jun-10

Statement of Event: The current estimated pension costs are based on existing data which is evaluated during the year and fixed annually. These provisional estimates are the basis for estimating legacy costs within the within the TTP Project. A risk exists that actual legacy costs are higher than estimated, creating a funding shortfall for the TTP Project.

Likelihood:	Likely	**Basis:** Pension costs are related to the stock market indices which do fluctuate.
Consequence / Benefit:	Crisis	**Basis:** A worst case would be that pension costs rise to the previously recorded high, which could add up to $8M to the cost of the TTP Project.

Most Significant Cost Impact ($k): 8,000 | **Most Significant Schedule Impact:** 0

Level:	**High**	**Event Trigger:** Currently open; Close upon completion of project.
Handling Strategy:	Accept	**Description:** There are no strategies to control the fluctuations in Legacy costs. If this risk is realized, a BCP will be developed to obtain additional funding from DOE contingency.

Handling Strategy Action Items:

HS Implementation Cost ($K):		**Basis:**
HS Implementation Schedule:		**Basis:**

Other Handling Strategies:

Statement of Residual Risk: A risk remains that actual legacy costs are higher than estimated, creating a funding shortfall for the TTP Project. If this risk is realized, a BCP will be developed to obtain additional funding from DOE contingency.

Residual Likelihood:	Likely	**Basis:** Pension costs are related to the stock market indices which do fluctuate.
Residual Consequence:	Crisis	**Basis:** A worst case would be that pension costs rise to the previously recorded high, which could add up to $8M to the cost of the TTP Project.

Residual Risk Level:	**High**			**Residual Impact Basis:** Worst Case: Pension costs rise to the previously recorded high, which could add up to $8M to the cost of the TTP Project. Most L kely Case: Pension costs rise, which add up to $4M to the cost of the TTP Project. Best Case: Pension costs rise, which add up to $2M to the cost of the TTP Project.
Residual Cost Impact ($K):	**Best Case** 2,000	**Most Likely** 4,000	**Worst Case** 8,000	
Residual Schedule Impact:	0	0	0	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: If this risk is realized, a BCP will be developed to obtain additional funding from DOE contingency.

Risk / Opportunity Assessment Form

ID Number: 119 **Revision:** 01 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Materials Pricing Increases Vendor Costs

Type: **Risk** External Programmatic | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PM - Project Manager | **Contact:** Jon Lunn | **Date Identified:** 8-Sep-10

Statement of Event: The TTP Project baseline includes vendor estimated cost of materials and an allowance for standard escalation. A risk exists that high worldwide demand for materials decrease availability (may even force unique mill runs for speciality materials etc.). The result would be Vendor subcontractors and suppliers estimates being received that exceed the budgeted amounts and schedule durations. Schedule impacts and costs that exceed the estimate and escalation assumed in the baseline.

Likelihood:	Unl kely	**Basis:** Cost estimate contains the pricing as seen at the time of the estimate; since the time of the estimate, material prices have stabilized/decreased; it is anticipated that prices will remain stable during the project execution period due to decreased demand during the economic turndown.
Consequence / Benefit:	Crisis	**Basis:** Cost increases were estimated at a worse case of $1.5M and a delay of up to 2 months (Reference TTT Risk #5)

Most Significant Cost Impact ($k): 1,500 | **Most Significant Schedule Impact:** 2 Mths

Level:	**High**	**Event Trigger:** Currently open; Close upon completion of Vendor acquisition of materials.
Handling Strategy:	Mitigate	**Description:** TTT to identify materials of construction early and seek early SRR approval to enable procurement. A LLP Plan is being developed by TTT to allow early ordering of materials. TTT will continue to monitor material availability/pricing and make adjustments to estimates as necessary.

Handling Strategy Action Items:

, , , ,

HS Implementation Cost ($K):	0	**Basis:** Within current cost baseline.
HS Implementation Schedule:	0	**Basis:** No impact to schedule.

Other Handling Strategies:

Statement of Residual Risk: A risk remains that materials supply impact is realized and pricing escalates.

Residual Likelihood:	Unl kely	**Basis:** Cost estimate contains the pricing as seen at the time of the estimate; since the time of the estimate, material prices have stabilized/decreased; it is anticipated that prices will remain stable during the project execution period due to decreased demand during the economic turndown.
Residual Consequence:	Critical	**Basis:** Prices increase supply interruptions occur and alloy materials require a special mill run.

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: Prices increase supply interruptions occur and alloy materials require a special mill run. Most L kely Case: Prices increase supply interruptions occur Best Case: Prices increase supply interruptions occur, however schedule float and escallation contingency accommodate the impact.
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 750	**Worst Case** 1,500	
Residual Schedule Impact:	0	1 Mth	2 Mths	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: Refer to Thor Treatment Technologies FBSR Risk Sheet #5.

Risk / Opportunity Assessment Form

ID Number: 121 **Revision:** 01 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: DOE do not Accept Procurement Strategy

Type: **Risk** External Programmatic | **Category:** DOE

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PM - Project Manager | **Contact:** Jon Lunn | **Date Identified:** 8-Sep-10

Statement of Event: A segmented procurement strategy has been approved by DOE (i.e. CD-2A/3A, CD-2B/3B and CD-3). A risk exists that DOE does not approve any changes to this strategy, procurements are not approved when required, and work cannot be released to TTT.

Likelihood:	Unl kely	**Basis:** Based on discussions with DOE.
Consequence / Benefit:	Crisis	**Basis:** If work cannot be released an impact of up to 6 months could be realiazed.

Most Significant Cost Impact ($k): 0 | **Most Significant Schedule Impact:** 6 Mths

Level:	**High**	**Event Trigger:** Currently open; Close upon the completion of procurement approvals by DOE.
Handling Strategy:	Mitigate	**Description:** SRR will meet regularly with DOE and provide update on any changes to procurement strategy.

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:

Statement of Residual Risk: A risk remains that DOE does not approve any changes to this strategy, procurements are not approved when required, and work cannot be released to TTT. If this risk is realized, a BCP will be developed to obtain additional funding from DOE contingency.

Residual Likelihood:	Unl kely	**Basis:** Based on discussions with DOE.
Residual Consequence:	Crisis	**Basis:** If work cannot be released an impact of up to 6 months could be realiazed.

Residual Risk Level:	**High**			**Residual Impact Basis:** Worst Case: Work cannot be released an impact of up to 6 months is realized. Most L kely Case: Some work is not released an impact of up to 3 months is realized. Best Case: A minimal amount of work is not released an impact of up to 6 months is realized
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact:	1 Mth	3 Mths	6 Mths	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: Reference TTT Risk # FBSR 16. If this risk is realized, a BCP will be developed to obtain additional funding from DOE contingency to compensate for the schedule delay.

Risk / Opportunity Assessment Form

ID Number: 122 **Revision:** 01 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Testing of Auger Grinder Indicates Major Design Rework is Required

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 1.2.5 | **Title:** Solids Handling

Responsible Org: SRR-DS - Design Services | **Contact:** Sergio Mazul | **Date Identified:** 8-Sep-10

Statement of Event: After fabrication, the Auger Grinder will be tested and the design finalized such that the module design can be finalized and module fabrication completed. A risk exists that during testing, a significant issue is discovered that results in having to re-design the Auger Grinder.

Likelihood:	Likely	**Basis:** The Auger Grinder design will be similar to the unit curently used at the Hazen Research pilot plant; recent pilot testing runs have been successful, however the auger shaft was bent during one of the pilot tests.
Consequence / Benefit:	Significant	**Basis:** Redesign of the Auger Grinder results in additional cost and schedule delay.

Most Significant Cost Impact ($k): 200 | **Most Significant Schedule Impact:** 1 Mth

Level:	**Moderate**	**Event Trigger:** Open on commencement of Auger Grinder testing; Close upon completion of Auger Grinder testing.
Handling Strategy:	Mitigate	**Description:** TTT to evaluate the Tank 48 Phase 1 and 3 test results relative to Auger Grinder performance and incorporate lessons learned into design. TTT to monitor test results from IWTU Auger Grinder test and if necessary design modifications and use lessons learned in the Tank 48 Auger Grinder Design.

Handling Strategy Action Items:

122-1 TTT to evaluate the Tank 48 Phase 1 and 3 test results relative to Auger Grinder performance and incorporate lessons into design., , , John Contardi,

122-2 TTT to monitor test results from IWTU Auger Grinder test and if necessary design modifications and use lessons learned in the Tank 48 Auger Grinder Design., , , John Contardi,

HS Implementation Cost ($K):	0	**Basis:**
HS Implementation Schedule:	0	**Basis:**

Other Handling Strategies:

Statement of Residual Risk:

Residual Likelihood:	Unl kely	**Basis:** Likelihood has been reduced though redesign and lessons learned from IWTU grinder testing.
Residual Consequence:	Significant	**Basis:** Redesign of the Auger Grinder results in additional cost and schedule delay.

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: Redesign of the Auger Grinder results in additional cost and schedule delay. Most L kely Case: Limited redesign of the Auger Grinder results in additional cost. Best Case: Neglig ble redesign of the Auger Grinder required.
Residual Cost Impact ($K):	Best Case 0	Most Likely 50	Worst Case 200	
Residual Schedule Impact:	0	0	1 Mth	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: Reference TTT Risk # FBSR 17

Risk / Opportunity Assessment Form

ID Number: 123 **Revision:** 01 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Design Comment Resolution Delays Design Completion

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PO - Project Owner | **Contact:** John Contardi | **Date Identified:** 8-Sep-10

Statement of Event: SRR will review TTT design and provide comments for formal disposition by resolution/incorporation. A risk exists that disposition of comments takes longer than planned based on both their complexity and the number being greater than anticipated.

Likelihood:	Unl kely	**Basis:** TTT has experienced delays during the review, comment and approval process during the ESTD testing. These delays impacted schedule dates and eroded float in the schedule. Work-arounds were implemented to preserve milestones, but in Engineering, this will be very difficult to recover.
Consequence / Benefit:	Significant	**Basis:** Delays in submittals, authorizations for procurement and etc., will result in schedule and cost impacts.

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

Level:	**Moderate**	**Event Trigger:** Open upon start of Task 3 review; Close upon successful completion of Task 3 review comment disposition.
Handling Strategy:	Mitigate	**Description:** Provide resident personnel to socialize issues with TTT early and resolve prior to reviews. SRR to discuss comments with TTT to ensure all are clearly understood before disposition begins.

Handling Strategy Action Items:

123-1 Provide resident personnel to socialize issues with TTT early and resolve prior to reviews., , , Jon Lunn,

123-2 SRR to discuss comments with TTT to ensure all are clearly understood before disposition begins., , , John Contardi,

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

Other Handling Strategies:

Statement of Residual Risk: A risk remains that disposition of comments takes longer than planned based on both their complexity and the number being greater than anticipated.

Residual Likelihood:	Very Unlikely	**Basis:** Likelihood has been reduced.
Residual Consequence:	Significant	**Basis:** Delays in submittals, authorizations for procurement and etc., will result in schedule and cost impacts.

Residual Risk Level:	**Low**			**Residual Impact Basis:** Worst Case: Delays in submittals, authorizations for procurement and etc., will result in schedule and cost impacts. Most L kely Case: Some delay in submittals, authorizations for procurement and etc., will result in schedule and cost impacts. Best Case: Minor delays in submittals, authorizations for procurement and etc., will result in minimal schedule and cost impacts.
Residual Cost Impact ($K):	**Best Case** 150	**Most Likely** 300	**Worst Case** 500	
Residual Schedule Impact:	2 Wks	1 Mths	2 Mths	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: Reference TTT Risk # FBSR 19

Risk / Opportunity Assessment Form

ID Number: 124 **Revision:** 01 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Process Optimization Continues After Flowsheets are Finalized

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PO - Project Owner | **Contact:** John Contardi | **Date Identified:** 9-Sep-10

Statement of Event: After flowsheet finalization design and fabrication is intended to be completed without any major perurbations in the final process flow. A risk exists that as opportunities arise for optimization of the process, flowsheet changes are made that impact physical design.

Likelihood:	Likely	**Basis:** Opportunities will be identified and although some can be exploited without impact to physical design, other may require varying degrees of design change.
Consequence / Benefit:	Crisis	**Basis:** Cost will increase and schedule will extend through incrementalizing small flowsheet/design changes. Larger changes could result in significant cost increases and schedule delays. The worst case would be the change from CRR to a catalytic thermal oxidizer.

Most Significant Cost Impact ($k): 3,000 | **Most Significant Schedule Impact:** 9 Mths

Level:	**High**	**Event Trigger:** Open upon finalizing Flowsheet Close upon completion of project
Handling Strategy:	Avoid	**Description:** Assign a PEM responsible for approval of flowsheet changes and coordination with design. Install and exercise change control over the TTP Process Flowsheet.

Handling Strategy Action Items:

124-1 Assign a Project Engineering Manager (Complete), , , Jon Lunn,

124-2 Develop/deploy change control process to control configuration of TTP Process Flowsheet., , , John Contardi,

HS Implementation Cost ($K):	0	**Basis:** Within existing cost baseline.
HS Implementation Schedule:	0	**Basis:** No schedule impact.

Other Handling Strategies:

Statement of Residual Risk: Optimization opportunities may still be identified, however they would be controlled through the change control process. Optimization may still occur, but utilization of the change control process will control will make these optimizations a project decision approved by SRR where schedule and available funding are critical factors in the approavl process.

Residual Likelihood:		**Basis:**		
Residual Consequence:		**Basis:**		
Residual Risk Level:				**Residual Impact Basis:**
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	
Residual Schedule Impact:				

Impacted Scope of Work:

Evaluation Comments:

Event Comments: Reference TTT Risk # FBSR 23

Risk / Opportunity Assessment Form

ID Number: 125 **Revision:** 01 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Numbering System Convention Changes

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PO - Project Owner | **Contact:** John Contardi | **Date Identified:** 9-Sep-10

Statement of Event: SRS numbering convention and process for obtaining numbers for drawings, components etc., is not compatible with TTT practice. SRS CLI numbers must be assigned in blocks for use by TTT and existing system (interfaces) CLIs must be correctly obtained from Smartplant for use by TTT. A risk exists that errors occur during this process resulting in rework to drawings and documentation.

Likelihood:	Unl kely	**Basis:** After completion of Task 2, it is unlikely that any tag changes will occur based on conformance to SRR "SHRINE" CLI tagging since the methodology and number sequences have been already established.
Consequence / Benefit:	Significant	**Basis:** Worst case impact to rework documentation e.g valve, instrument and equipment lists and P&IDs.

Most Significant Cost Impact ($k): 100 | **Most Significant Schedule Impact:** 2 Mths

Level:	**Moderate**	**Event Trigger:** Currently open; Close upon completion and approval of detailed design.
Handling Strategy:	Mitigate	**Description:** Develop and deploy a change control process.

Handling Strategy Action Items:

125-1 Develop and deploy a change control process., , , John Contardi,

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

Other Handling Strategies:

Statement of Residual Risk: A risk remains that errors occur during the drawing and CLI numbering process resulting in rework to drawings and documentation.

Residual Likelihood:	Unl kely	**Basis:** After completion of Task 2, it is unlikely that any tag changes will occur based on conformance to SRR "SHRINE" CLI tagging since the methodology and number sequences have been already established.
Residual Consequence:	Significant	**Basis:** Impact to rework documentation e.g valve, instrument and equipment lists and P&IDs.

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: Rework documentation e.g valve, instrument and equipment lists and P&IDs. Most L kely Case: Some rework to documentation e.g valve, instrument and equipment lists and P&IDs. Best Case: Minor rework to documentation e.g valve, instrument and equipment lists and P&IDs.
Residual Cost Impact ($K):	**Best Case** 25	**Most Likely** 50	**Worst Case** 100	
Residual Schedule Impact:	2 Wks	1 Mth	2 Mth	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: Reference TTT Risk # FBSR 38

Risk / Opportunity Assessment Form

ID Number: 126 **Revision:** 01 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Vendor Underestimates Complexity of SRS SOW Requirements

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PO - Project Owner | **Contact:** John Contardi | **Date Identified:** 9-Sep-10

Statement of Event: When compared to industry standards and consensus codes, SOW imposes additional requirements and in certain cases more stringent requirements. A risk exists that the vendor underestimates the complexity of complying with these additional requirements. This risk may also be realized with sub-vendors to TTT (i.e. additional costs and/or reluctance to bid).

Likelihood:	Likely	**Basis:** Recent evaluation of the implementation of SOW requirements by the vendor for materials and welding have resulted in additional cost and schedule impacts.
Consequence / Benefit:	Crisis	**Basis:** Additional costs for rework, and additional/ more detailed process steps not included in the initial vendor estimate.

Most Significant Cost Impact ($k): 2,500 | **Most Significant Schedule Impact:** 6 Mths

Level:	**High**	**Event Trigger:** Currently open; Close upon completion and approval of final design.
Handling Strategy:	Mitigate	**Description:** Vendors to evaluate high potential requirements and communicate impacts to SRR. Use RFIs and SDDRs to communicate issues and resolution. Develop and deploy change control.

Handling Strategy Action Items:

126-1 Develop and deploy change control., , , John Contardi,

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

Other Handling Strategies:

Statement of Residual Risk: A risk remains that the vendor underestimates the complexity of complying with these additional requirements. This risk may also be realized with sub-vendors to TTT (i.e. additional costs and/or reluctance to bid).

Residual Likelihood:	Likely	**Basis:** Likelihood has not been greatly reduced and remains l kely.
Residual Consequence:	Critical	**Basis:** Additional costs for rework, and additional/ more detailed process steps not included in the initial vendor estimate.

Residual Risk Level:	**High**			**Residual Impact Basis:** Worst Case: Additional costs for rework, and additional/ more detailed process steps not included in the initial vendor estimate. Most L kely Case: Additional costs for some rework, and additional/ more detailed process steps not included in the initial vendor estimate. Best Case: Additional costs for Minor rework , and additional/ more detailed process steps not included in the initial vendor estimate.
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	
	500	1,000	2,500	
Residual Schedule Impact:	1 Mth	1 Mths	2 Mths	

Impacted Scope of Work:

Evaluation Comments:

Event Comments: Reference TTT Risk # FBSR 39.

Risk / Opportunity Assessment Form

ID Number: 127 **Revision:** 01 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Flow-down Requirements Imposed on Sub-vendors Impede Lower-tier Procurement Process

Type: **Risk** Internal Technical | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PO - Project Owner | **Contact:** John Contardi | **Date Identified:** 9-Sep-10

Statement of Event: SRR Engineering documentation requirements, Quality Verification Document Requirements, FAR and DEAR Requirements, past vessel fabrication document requirements, contract required submittals and data submitals are much more involved than normally required elsewhere in the industry. A risk exists that sub-vendors unfamiliar with this rigororous approach will refuse to bid, increase costs, underestimate schedule etc., resulting in cost impacts and delays to the prime vendor and hence the project.

Likelihood:	Likely	**Basis:** Based on SRR Engineering documentation requirements, Quality Verification Document Requirements, FAR and DEAR Requirements, past vessel fabrication document requirements and contract required submittals, data submitals will be voluminous.
Consequence / Benefit:	Significant	**Basis:** Engineering resources, document control systems etc., can be overloaded resulting in delays and additional costs.

Most Significant Cost Impact ($k): 1,000 | **Most Significant Schedule Impact:** 2 Mths

Level:	**Moderate**	**Event Trigger:** Currently open: close upon completiong of sub-vendor activities
Handling Strategy:	Mitigate	**Description:** Primary vendor to: develop a contract deliverables list to accurately identify documents required to be submitted or generated at the time of submittal; review design specifications to assure only "Code Required" and "Contract Required" documents are listed, minimizing unnecessary submittals; assure all submittal requirements are clearly understood by having Fabrication Manager, Engineering Manager and ESH&Q Manager meet with sub-vendor; ensure Procurement Manager, Engineering Manager and ESH&Q Manager review purchasing documents to assure submittals are properly included.

Handling Strategy Action Items:

127-1 Develop a contract deliverables list to accurately identify documents required to be submitted or generated at the time of submittal. (Marudas), , , Sergio Mazul,

127-2 Review design specifications to assure only "Code Required" and "Contract Required" documents are listed. (Marudas/Henkel), , , Sergio Mazul,

127-3 Assure all submittal requirements are clearly understood by having Fabrication Manager, Engineering Manager and ESH&Q Manager meet with sub-vendor (Marudas/Henkel/Bell/Davidson/Pavlosky), , , Sergio Mazul,

127-4 Ensure Procurement Manager, Engineering Manager and ESH&Q Manager review purchasing documents to assure submittals are properly included. (Henkel/Bell/Davidson), , , Woody Meadows,

HS Implementation Cost ($K):	0	**Basis:** Within current baseline.
HS Implementation Schedule:	0	**Basis:** No impact to schedule.

Other Handling Strategies:

Statement of Residual Risk: A risk remains that sub-vendors unfamiliar with this rigororous approach will refuse to bid, increase costs, underestimate schedule etc., resulting in cost impacts and delays to the prime vendor and hence the project.

Residual Likelihood:	Unl kely	**Basis:** Based on SRR Engineering documentation requirements, Quality Verification Document Requirements, FAR and DEAR Requirements, past vessel fabrication document requirements and contract required submittals, data submitals will be voluminous.
Residual Consequence:	Significant	**Basis:** Engineering resources, document control systems etc., can be overloaded resulting in delays and additional costs.

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: Significant Delay and additional cost incurred.
Residual Cost Impact ($K):	**Best Case**	**Most Likely**	**Worst Case**	Most L kely Case: Some delay and additional cost incurred.
	50	250	500	Best Case: Minor delay and additional cost incurred.

Risk / Opportunity Assessment Form

ID Number: 127 **Revision:** 01 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Residual Schedule Impact:	2 Wks	2 Wks	1 Mth	
Impacted Scope of Work:				
Evaluation Comments:				
Event Comments: Reference TTT Risk # FBSR 41.				

Risk / Opportunity Assessment Form

ID Number: 128 **Revision:** 00 **Last Date Evaluated:** 13-Oct-10 **Status:** Active

Event Title: Refractory Damaged During Transportation

Type: **Risk** External Technical | **Category:** SRR

Assess. Element: 3.0 | **Title:** General

Responsible Org: SRR-PM - Project Manager | **Contact:** Jon Lunn | **Date Identified:** 13-Oct-10

Statement of Event: The vessels with refractory linings will be assembled and shipped with their linings installed. A risk exists that during transportation the refractory liner is damaged.

Likelihood:	Likely	**Basis:** The vessels will be shipped for a considerable distance and the refractories are known to be fragile.
Consequence / Benefit:	Critical	**Basis:** Insurance by the vendor will ensure cost of repairing/replacing the refractory will not be incurred by SRR, however aschedule impact of up to 3 months can be realized while the repairs are being made.

Most Significant Cost Impact ($k): 0 | **Most Significant Schedule Impact:** 3 Mths

Level:	**High**	**Event Trigger:**
Handling Strategy:	Mitigate	**Description:** Ensure the refractory plan includes specific and adequate transportation precautions against damage to the refractory.

Handling Strategy Action Items:

128-1 Review vendor's refractory plan to ensure it includes specific and adequate transportation precautions against damage to the refractory., , , Sergio Mazul,

HS Implementation Cost ($K):	0	**Basis:** Within cost Baseline.
HS Implementation Schedule:	0	**Basis:** No impact to schedule baseline.

Other Handling Strategies:

Statement of Residual Risk: A risk remains that during transportation the refractory liner is damaged.

Residual Likelihood:	Unl kely	**Basis:** Likelihood has been reduced with a validated transportation plan.
Residual Consequence:	Critical	**Basis:** Refractory replacement is necessary. Insurance covers cost, however, schedule impact is realized.

Residual Risk Level:	**Moderate**			**Residual Impact Basis:** Worst Case: Refractory replacement is necessary. Insurance covers cost, however, schedule impact is realized. Most L kely and Best cases: Refractory repair is necessary. Insurance covers cost, however, schedule impact is realized.
Residual Cost Impact ($K):	**Best Case** 0	**Most Likely** 0	**Worst Case** 0	
Residual Schedule Impact:	1 Mth	1 Mth	3 Mths	

Impacted Scope of Work:

Evaluation Comments:

Event Comments:

7.9: Riskometer (Example)

TTP RISKOMETER (FBSR)
STATUS AS OF 10/14/2010

Risk Number	Risk Title	Risk Level	Closed	Acceptable Risk	Minor Concern	Major Concern	Remarks
001	Funding Availability	N/A			●		Project will be baselined at CD-2.
002	Interfaces with Other Facilities and Projects	High			●		Keep H-Tank Farm Facility Project Owners & Managers informed about project needs/progress. Maintain integrated project schedule with appropriate logic ties between project & facility activities.
003	Sampling and Analysis Turnaround Impacts Production	Moderate			●		Develop Sample & Analytical Plans well in advance of actual operations including a strategy where a sample of every transfer is not required, i.e. take weekly or monthly samples similar to what is done for the evaporator overheads. Ensure back-up instrumentation is provided by operations in case of equipment failure. Develop a contingency plan if analytical results are not available, i.e. tighten the acceptable tolerance of the latest sample to verify results and to justify continued operation.
004	Accessibility for Construction Work	High			●		Coordinate work with operations and other projects through participation in facility Work Window Lock-ins, 8 Week Lookaheads (T8s), and Plan of the Days (PODs). When activities are locked in, ensure critical resources (i.e. rigging, radcon, IH, etc.) are onboard and ready to support.
007	DOE Directed Changes to Technical Requirements	High			●		Changes to the Technical baseline imposed by DOE would be a change in project scope and a BCP would be generated. Implementation strategy for STD-1066 has not been approved by DOE.
008	Availability of Construction Equipment	Moderate			●		This risk is accepted based on priority being requested for on-site crane. Although priority for crane usage is requested, a higher priority could still "bump" this project.
009	Readiness/ORR Assessment Findings	Moderate			●		Project Team develop and perform detailed management checklist prior to beginning RA. Continued engagement of DOE, Operations and Safety organizations in the system design reviews and testing activities. DOE Operations and Safety organizations to participate in test activities conducted before the DOE ORR. Engage the DOE ORR Team prior to the SAT to enable the team to become familiar with the systems and operations.
011	Unsafe Conditions Discovered at Turnover	Moderate			●		SMI-51 walkdown team to particpate in design reviews and weekly walkdowns.
012	Stakeholder Participation	Moderate			●		Develop communication plan for involving stakeholders. Keep Stakeholders/Senior Management informed of R&D results. If stakeholders do impose additional design/operational /research/testing requirements on the project, a BCP will be developed.
013 SDIT	Safety Basis not Accepted By DOE	High			●		Ensure formal/informal DOE involvement during safety basis development and prior to WSRC request for approval to avoid final minute surprises. DOE will participate in the CHA meetings, and SIRCs. Briefing of positions will be given to DOE Engineering at key points in the development of the safety basis.
014	Resources Not Available	Moderate			●		Establish project baselines and key contract milestones. Maintain timely funding authorizations and accurate resource forecasts for all support organizations.
016 SDIT	Implementation of DNFSB Recommendation 2004-2 Required	High				●	SDS and PDSAR will help gain DOE approval. SRR-approved evaluation does not require any modifications.
019 SDIT	Addition of the GAC to Design	High			●		ESTD test data and preliminary evaluation indicate GAC (Granulated Activated Carbon) bed for offgas mercury removal will not be required. This will be confirmed during the production unit design phase.
020 SDIT	Analysis of 241-96H Structure Shows Not-Qualified for II/I Concerns	High		●			Project will be designed to II/I criteria.

7.10: T&PRA Analysis

Risk ID	Title	Likelihood	Cost			Schedule[1]		
			BC	MLC	WC	BC	MLC	WC
002	Interfaces with Other Facilities and Projects	Likely	0	50	50	0	1 Wk	2 Wks
004	Accessibility for Construction Work	Likely	0	50	100	0	2 Wks	4 Wks
007	DOE Directed Changes to Technical Requirements	Very Unlikely	500	1,000	5,000	0	6 Wks	6 Mths
008	Availability of Construction Equipment	Unlikely	0	0	100	0	1 Wk	1 Mth
009	Readiness/ORR Assessment Findings	Very Unlikely	10	25	50	0	2 Wks	1 Mth
011	Unsafe Conditions Discovered at Turnover	Unlikely	0	75	100	0	2 Wks	3 Wks
012	Stakeholder Participation	Unlikely	500	1000	1500	0	1 Mth	2 Mth
013	Safety Basis not Accepted By DOE	Very Unlikely	20	250	1,000	0	2 Wks	2 Mths
014	Resources Not Available	Unlikely	0	100	200	0	4 Wks	8 Wks
016	Implementation of DNFSB Recommendation 2004-2 Required	Unlikely	500	1,000	25,000	1 Mth	2 Mths	6 Mths
019	Addition of the GAC to Design	Very Unlikely	500	500	500	2 Mths	2 Mths	3 Mths
022	Interfaces With New Contractor Impacts Project	Very Unlikely	0	250	1000	0	4 Mths	6 Mths
023	Design Assumptions and Design Uncertainties Result In Rework	Unlikely	0	500	1500	2 Mths	2 Mths	3 Mths
024	Insufficient Maintainability Provided	Unlikely	10	50	100	1 Wk	2 Wks	1 Mth
027	Availability of Consumables	Unlikely	0	0	0	1 Wk	1 Wk	1 Wk
033	Long Lead Procurement is Denied or Delayed	Unlikely	0	0	0	6 Wks	13 Wks	26 Wks

043	Engineered Equipment (Modules/Skids) Deliveries do not Support Project Schedule	Unlikely	0	100	200	0	2 Mths	3 Mths
057	Integration of Multiple Internal Technical Agencies	Unlikely	0	50	100	0	1 Wk	2 Wks
058	Multiple Design Input Documents	Very Unlikely	0	15	25	0	1 Wk	2 Wks
061	Facility Space Limitations	Likely	500	1,000	5,000	0	2 Mths	6 Mths
063	FBSR Equipment Transportation Requires Additional Precautions	Very Unlikely	0	50	100	0	2 Wks	4 Wks
064	Multiple External Interfaces	Very Unlikely	0	50	100	0	4	6 Wks
066	Emergent Startup Issues	Likely	40	100	125	1 Wk	4 Wks	8 Wks
069	Facility Services Design Complexity	Very Unlikely	25	50	100	0	1 Wk	2 Wks
070	Persistent Contamination Control Issues	Very Unlikely	0	10	50	0	1 Wk	2 Wks
076	Aggressive Post Installation Testing Schedule	Unlikely	10	25	50	0	1 Wk	2 Wks
085	Maintenance Requires Remote Operations	Likely	300	600	2000	1 Mth	2 Mths	4 Mths
093	Accident Analysis Determines Additional Safety Controls are Required	Unlikely	500	500	500	2 Wks	3 Wks	4 Wks
102	DWPF Particle Size Requirements Not Met	Unlikely	300	500	1000	2 Mths	3 Mths	6 Mths
103	Doorstops Are Not Available As Needed to Support Sampling Activities	Likely	0	600	800	0	2 Mths	3 Mths
104	SCDHEC Permitting Engineering Resources Are Not Available	Unlikely	0	0	0	1 Wk	2 Wks	4 Wks
108	SCDHEC IWT Construction Permit Issuance Is Delayed	Likely	50	50	50	1 Mth	2 Mths	3 Mths
109	Non-Rad (SCDHEC-BAQ (Bureau of Air Quality) Construction Permit is Delayed	Likely	10	25	50	0	0	0

112	During Startup Additional Samples Are Required	Likely	25	50	100	0	1Mths	2 Mths
117	Additional Project Reviews are Required	Likely	100	200	300	1 Mth	2 Mths	3 Mths
118	Legacy Costs Increase	Likely	2,000	4,000	8,000	0	0	0
119	Materials Pricing Increases Vendor Costs	Unlikely	0	750	1,500	0	1 Mth	2 Mths
121	DOE do not Accept Procurement Strategy	Unlikely	0	0	0	1 Mth	3 Mths	6 Mths
122	Testing of Auger Grinder Indicates Major Design Rework is Required	Unlikely	0	50	200	0	0	1 Mth
123	Design Comment Resolution Delays Design Completion	Very Unlikely	150	300	500	2 Wks	1 Mths	2 Mths
125	Numbering System Convention Changes	Unlikely	25	50	100	2 Wks	1 Mth	2 Mth
126	Vendor Underestimates Complexity of SRS SOW Requirements	Likely	500	1,000	2,500	1 Mth	1 Mths	2 Mths
127	Flow-down Requirements Imposed on Sub-vendors Impede Lower-tier Procurement Process	Unlikely	50	250	500	2 Wks	2 Wks	1 Mth
128	Refractory Damaged During Transportation	Unlikely	0	0	0	1 Mth	1 Mth	3 Mths

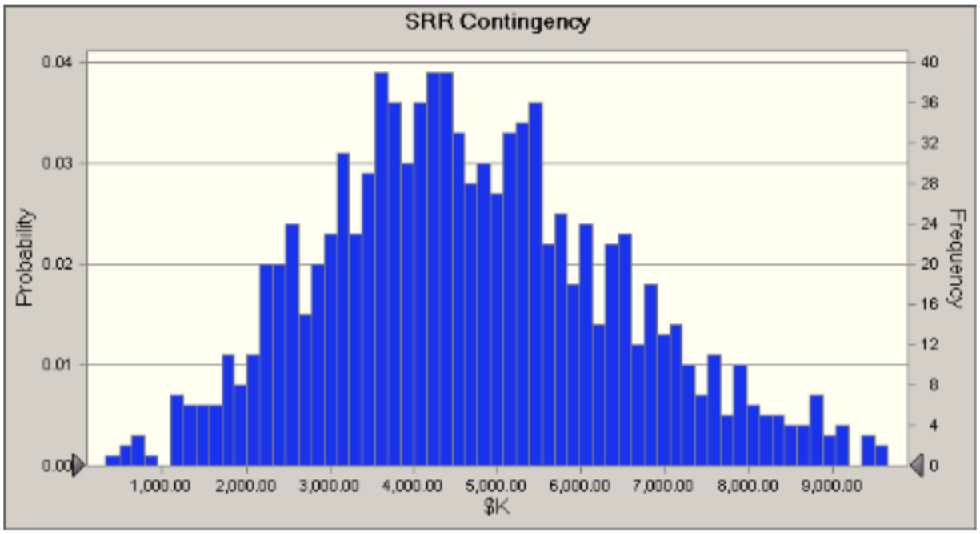
BC – Best Case; MLC – Most Likely Case; WC – Worst Case

DOE-owned Risks

1 – Schedule impact data was be used to determine schedule T&PRA contingency and cost of schedule contingency at appropriate confidence levels for use in deriving MR and DOE Contingencies.

Results for SRR-Owned Risks

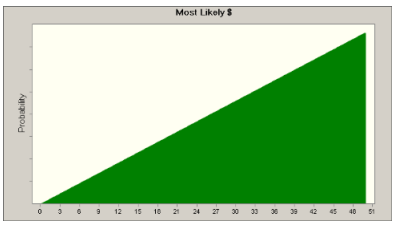
Percentiles:	Forecast values
0%	330.21
10%	2,463.02
20%	3,152.68
30%	3,661.42
40%	4,116.09
50%	4,515.96
60%	5,050.07
70%	5,482.35
80%	6,185.40
90%	7,083.34
100%	10,154.05



Risk 002: Interfaces with Other Facilities and Projects

Triangular distribution with parameters:

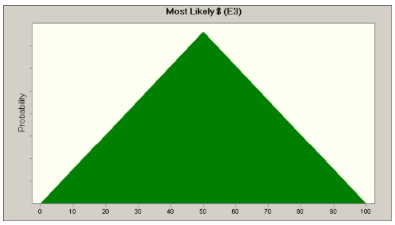
Minimum	0
Likeliest	50
Maximum	50



Risk 004: Accessibility for Construction Work

Triangular distribution with parameters:

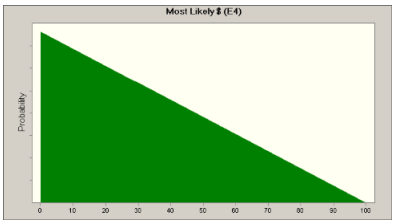
Minimum	0
Likeliest	50
Maximum	100



Risk 008: Availability of Construction Equipment

Triangular distribution with parameters:

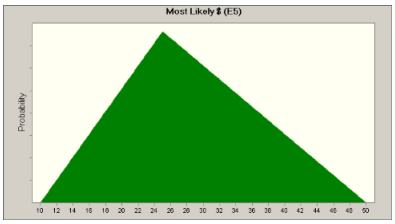
Minimum	0
Likeliest	0
Maximum	100



Risk 009: Readiness/ORR Assessment Findings

Triangular distribution with parameters:

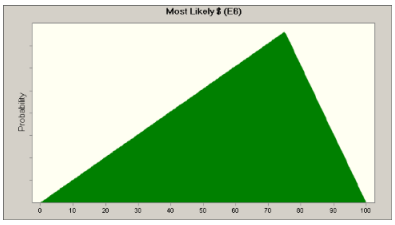
Minimum	10
Likeliest	25
Maximum	50



Risk 011: Unsafe Conditions Discovered at Turnover

Triangular distribution with parameters:

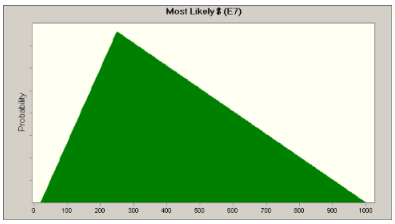
Minimum	0
Likeliest	75
Maximum	100



Risk 013: Safety Basis not Accepted By DOE

Triangular distribution with parameters:

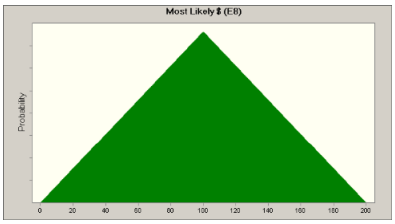
Minimum	20
Likeliest	250
Maximum	1000



Risk 014: Resources Not Available

Triangular distribution with parameters:

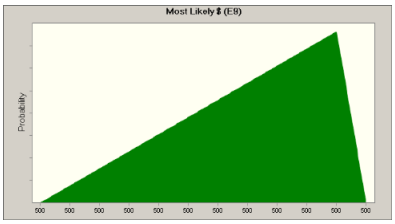
Minimum	0
Likeliest	100
Maximum	200



Risk 019: Addition of the GAC to Design

Triangular distribution with parameters:

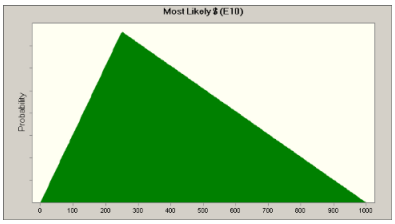
Minimum	500
Likeliest	500
Maximum	500



Risk 022: Interfaces With New Contractor Impacts Project

Triangular distribution with parameters:

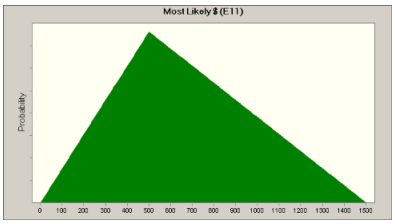
Minimum	0
Likeliest	250
Maximum	1000



Risk 023: Design Assumptions and Design Uncertainties Result In Rework

Triangular distribution with parameters:

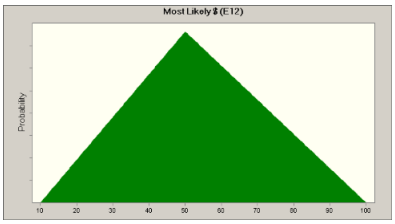
Minimum	0
Likeliest	500
Maximum	1500



Risk 024: Insufficient Maintainability Provided

Triangular distribution with parameters:

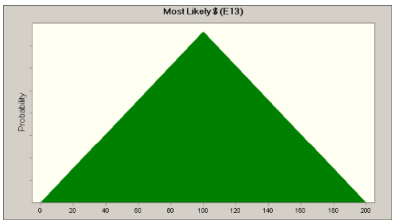
Minimum	10
Likeliest	50
Maximum	100



Risk 043: Engineered Equipment (Modules/Skids) Deliveries do not Support Project Schedule

Triangular distribution with parameters:

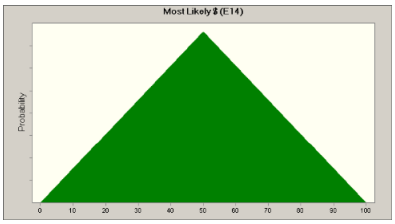
Minimum	0
Likeliest	100
Maximum	200



Risk 057: Integration of Multiple Internal Technical Agencies

Triangular distribution with parameters:

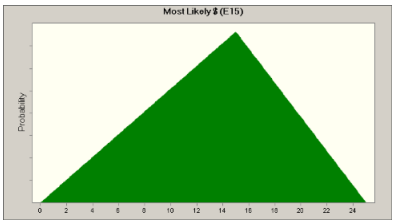
Minimum	0
Likeliest	50
Maximum	100



Risk 058: Multiple Design Input Documents

Triangular distribution with parameters:

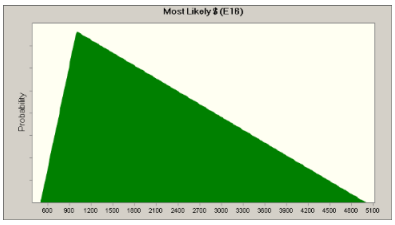
Minimum	0
Likeliest	15
Maximum	25



Risk 061: Facility Space and Weight Limitations

Triangular distribution with parameters:

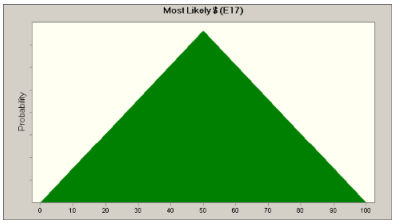
Minimum	500
Likeliest	1000
Maximum	5000



Risk 063: FBSR Equipment Transportation Requires Additional Precautions

Triangular distribution with parameters:

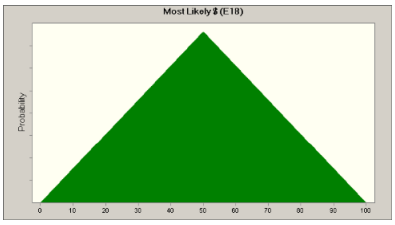
Minimum	0
Likeliest	50
Maximum	100



Risk 064: Multiple External Interfaces

Triangular distribution with parameters:

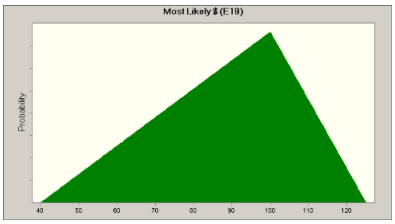
Minimum	0
Likeliest	50
Maximum	100



Risk 066: Emergent Startup Issues

Triangular distribution with parameters:

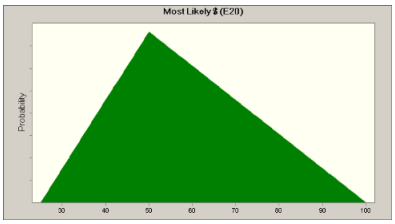
Minimum	40
Likeliest	100
Maximum	125



Risk 069: Facility Services Design Complexity

Triangular distribution with parameters:

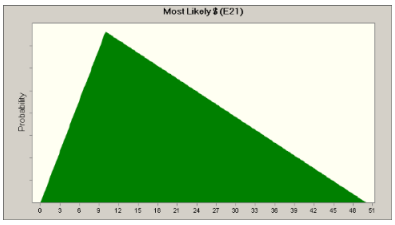
Minimum	25
Likeliest	50
Maximum	100



Risk 070: Persistent Contamination Control Issues

Triangular distribution with parameters:

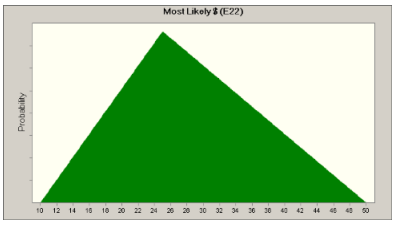
Minimum	0
Likeliest	10
Maximum	50



Risk 076: Aggressive Post Installation Testing Schedule

Triangular distribution with parameters:

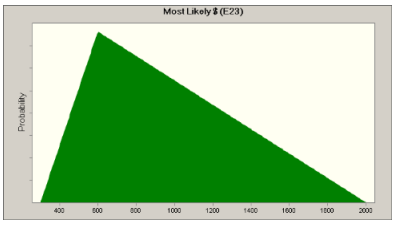
Minimum	10
Likeliest	25
Maximum	50



Risk 085: Maintenance Requires Remote Operations

Triangular distribution with parameters:

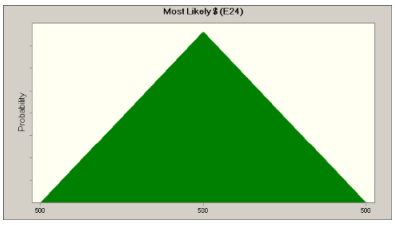
Minimum	300
Likeliest	600
Maximum	2000



Risk 093: Accident Analysis Determines Additional Safety Controls are Required

Triangular distribution with parameters:

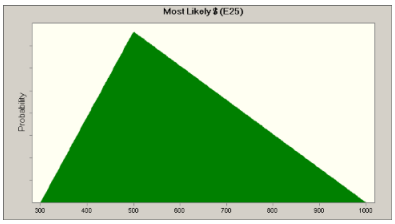
Minimum	500
Likeliest	500
Maximum	500



Risk 102: DWPF Particle Size Requirements Not Met

Triangular distribution with parameters:

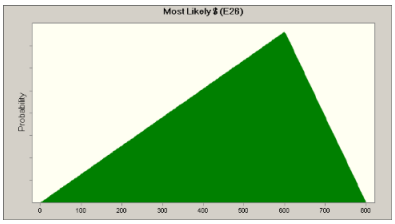
Minimum	300
Likeliest	500
Maximum	1000



Risk 103: Doorstops Are Not Available As Needed to Support Sampling Activities

Triangular distribution with parameters:

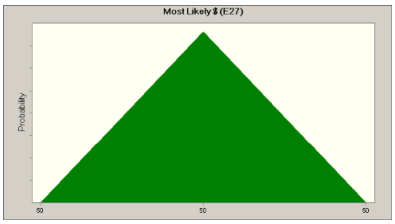
Minimum	0
Likeliest	600
Maximum	800



Risk 108: SCDHEC IWT Construction Permit Issuance Is Delayed

Triangular distribution with parameters:

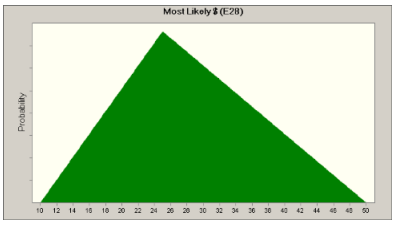
Minimum	50
Likeliest	50
Maximum	50



Risk 109: Non-Rad (SCDHEC-BAQ (Bureau of Air Quality) Construction Permit is Delayed

Triangular distribution with parameters:

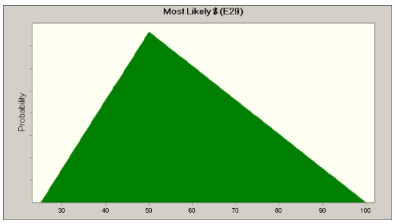
Minimum	10
Likeliest	25
Maximum	50



Risk 112: During Startup Additional Samples Are Required

Triangular distribution with parameters:

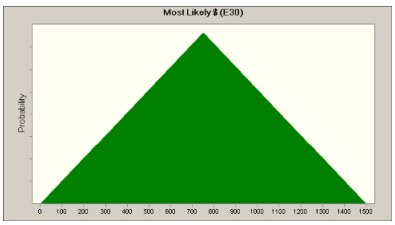
Minimum	25
Likeliest	50
Maximum	100



Risk 119: Materials Pricing Increases Vendor Costs

Triangular distribution with parameters:

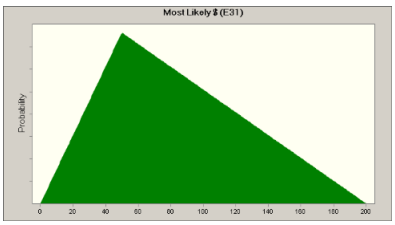
Minimum	0
Likeliest	750
Maximum	1500



Risk 122: Testing of Auger Grinder Indicates Major Design Rework is Required

Triangular distribution with parameters:

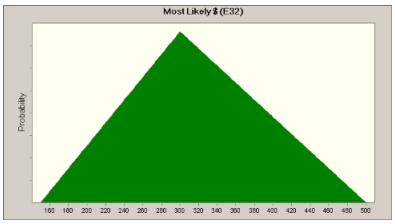
Minimum	0
Likeliest	50
Maximum	200



Risk 123: Design Comment Resolution Delays Design Completion

Triangular distribution with parameters:

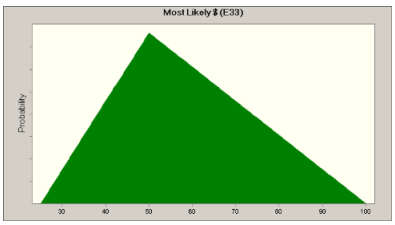
Minimum	150
Likeliest	300
Maximum	500



Risk 125: Numbering System Convention Changes

Triangular distribution with parameters:

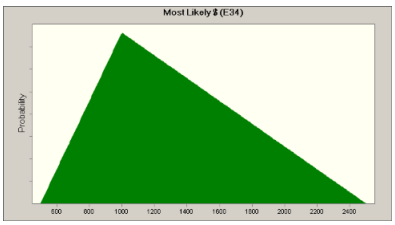
Minimum	25
Likeliest	50
Maximum	100



Risk 126: Vendor Underestimates Complexity of SRS SOW Requirements

Triangular distribution with parameters:

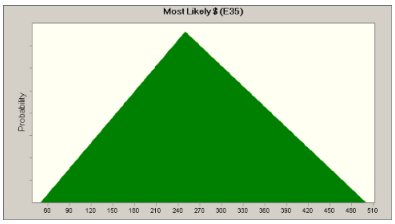
Minimum	500
Likeliest	1000
Maximum	2500



Risk 127: Flow-down Requirements Imposed on Sub-vendors Impede Lower-tier Procurement Process

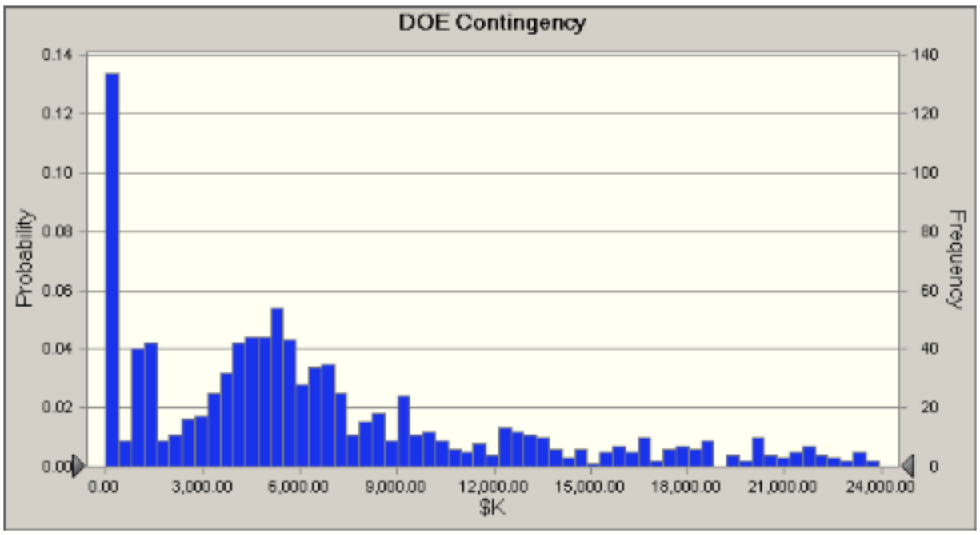
Triangular distribution with parameters:

Minimum	50
Likeliest	250
Maximum	500



Results for DOE-Owned Risks

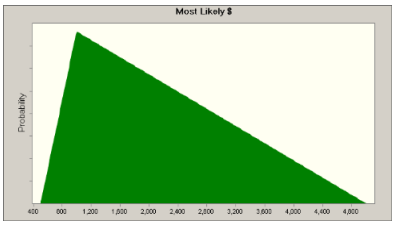
Percentiles:	Forecast values
0%	0.00
10%	209.70
20%	1,275.95
30%	3,500.43
40%	4,499.97
50%	5,330.36
60%	6,394.23
70%	7,944.52
80%	10,982.06
90%	16,636.96
100%	26,567.91



Risk 007: DOE Directed Changes to Technical Requirements

Triangular distribution with parameters:

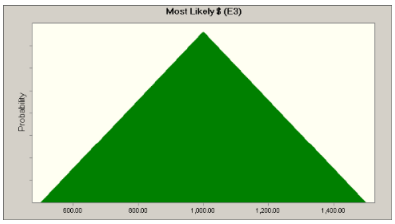
Minimum	500
Likeliest	1,000
Maximum	5,000



Risk 012: Stakeholder Participation

Triangular distribution with parameters:

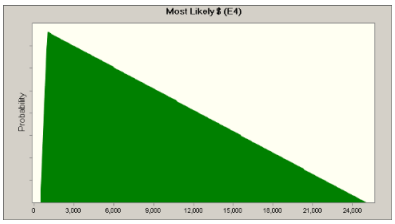
Minimum	500.00
Likeliest	1,000.00
Maximum	1,500.00



Risk 016: Implementation of DNFSB Recommendation 2004-2 Required

Triangular distribution with parameters:

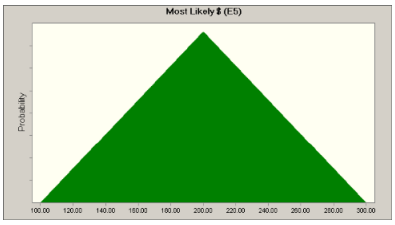
Minimum	500
Likeliest	1,000
Maximum	25,000



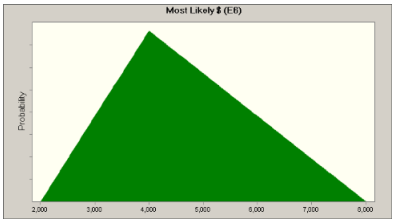
Risk 117 : Additional Project Reviews are Required

Triangular distribution with parameters:

Minimum	100.00
Likeliest	200.00
Maximum	300.00



Risk 118: Legacy Costs Increase

Triangular distribution with parameters:

Minimum	2,000
Likeliest	4,000
Maximum	8,000