TFA
TANKS
FOCUS AREA

Site Needs Assessment FY 1999

April 1999

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Pacific Northwest National Laboratory
Richland, Washington 99352

Executive Summary

The Tanks Focus Area's (TFA's) mission is to deliver integrated technical solutions that enable tank waste remediation to be successful across the Department of Energy (DOE) complex. To do this, the TFA

- Brings together users and technical experts to define and execute the mission
- Integrates the work across the sites and other funding organizations
- Builds teams of users and providers to deliver and deploy technical solutions.

The TFA uses a systematic process for developing its annual program that draws from the tanks technology development needs expressed by five DOE tank waste sites – Hanford Site, Idaho National Engineering and Environmental Laboratory (INEEL), Oak Ridge Reservation (ORR), Savannah River Site (SRS), and West Valley Demonstration Project (WVDP) (New York). The process is iterative and involves the following steps:

- Collection of site needs
- Needs analysis
- Development of technical responses and initial prioritization
- Refinement of the program for the next FY
- Formulation of the Corporate Review Budget (CRB)
- Preparation of Program Execution Guidance (PEG) for the next FY
- Revision of the Multiyear Program Plan (MYPP).

This document describes the outcomes of the first phase of this process, from collection of site needs to the initial prioritization of technical activities.

During FY 1999, the WVDP joined the original four tank waste sites (Hanford, INEEL, ORR, and SRS) as the fifth tank waste site included within the TFA family. The TFA is working to ensure that WVDP's participation in the TFA program benefits not only WVDP, but other DOE sites as well.

Each site's Site Technology Coordination Group (STCG) was responsible for developing and delivering priority tank waste needs. The TFA was pleased to receive site needs in October - November 1998, earlier than in previous fiscal years. A total of 98 site needs were received, an increase of 23 over the previous year. The needs were analyzed and integrated, where

Table ES.1. Summary of Site Needs Submitted to the Tanks Focus Area

	Hanford	INEEL	ORR	SRS	WVDP	Total
Safety	4	2	1	2	1	10
Characterization	3	8	1	1	1	14
Pretreatment	2	13	2	4	0	21
Immobilization	4	11	1	4	2	22
Retrieval	7	1	2	6	2	18
Closure	4	6	1	1	1	13
Total	24	41	8	18	7	98

appropriate. Fifty distinct technical responses were drafted and prioritized. The TFA matched each need to one or more of six functions: safety, characterization, pretreatment, immobilization, retrieval, and closure. A summary of the TFA's functional assignment of the needs is shown in Table ES.1.

To prioritize the technical responses, the TFA used five rating criteria:

- **Broad-based benefit** – This criterion rated whether the technical responses could satisfy needs at multiple sites (complex-wide impact).

- **User commitment to deploy** – The TFA assessed the user's commitment based on interest expressed in the needs description and present or future co-funding of development and/or deployment.

- **Relationship to Paths to Closure** - This criterion considered the Paths to Closure (PTC) priority, critical path milestone risks, and waste stream risks related to a technical response.

- **Other technical impact** – The TFA considered a technical response's impacts on schedule, cost avoidance, and link to regulatory requirements.

- **Implementation Potential** - This criterion values a strategic task that has the potential to result in an implementation.

Draft technical responses were prepared and provided to the TFA Technical Advisory Group for technical review, then to the TFA Site Representatives and the TFA User Steering Group (USG) for their review and comment. These responses were discussed at a March 25, 1999 meeting where the TFA Management Team established the priority listing in preparation for input to the DOE Office of Science and Technology (OST) budget process. At the time of publication of this document, the TFA continues to finalize technical responses as directed by the TFA Management Team and clarify the intended work scopes for FY 2000 and FY 2001.

Presently, the FY 2001 CRB is under development, reflecting the priorities established by the TFA Management Team.

The TFA screened out six needs that were not considered within the TFA mission area, did not have a technology development component, or for which a response was not feasible in cost or schedule.
Each year the TFA takes a critical look at its needs assessment process to determine where to direct self-improvement efforts for the next year. This was the first program development cycle where the TFA went into the process expecting to perform in accordance with the "focus area-centered" concept. For the TFA, this concept requires that the TFA coordinate all DOE Office of Science and Technology programs that address radioactive high-level tank waste science and technology needs from across the DOE complex. The TFA's primary program partners include the

- Characterization, Monitoring, and Sensor Technology (CMST) Program
- Efficient Separations Program (ESP)
- Robotics Program
- Industry Programs
- University Programs
- International Programs
- Accelerated Site Technology Deployment (ASTD) program
- Environmental Management Science Program (EMSP).

Coordinating site needs analyses and technical response development with and between these programs was expected to be a sizeable task, and the TFA's expectations were met. While the TFA was successful in interacting with the above program partners, next year's process may be further improved by more careful timing and increased communication. The most significant improvements may be realized in the TFA's approach to the receipt and response to site science needs. More work is required to explicitly define focus area roles in planning and executing OST-funded science projects in response to site science needs.

The timing of certain corporate program development activities created problems during the front end of this year's program development cycle. DOE's decision to initiate new database systems as part of the Integrated Planning, Accounting, and Budgeting System (IPABS) required site users and the TFA to produce data and documentation supporting the FY 2001 CRB too early in the program development process. It also revealed possible widespread data quality issues, notably in the documentation of waste streams. This affected the TFA's prioritization of technical responses, in that waste stream risk data was likely out-of-date, critical path milestone information was unavailable, and project baseline summaries (PBSs) had not been revised. The TFA will do its part to correct these timing and data quality issues to support next year's corporate budgeting activities.

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Acronyms

Al	aluminum
APCS	Air Pollution Control System
ASTM	American Society for Testing Materials
BVEST	Bethel Valley Evaporator Service Tank
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CIF	Consolidated Incineration Facility
CRB	Corporate Review Budget
Cs	cesium
CSSF	Calcine Solids Storage Facility
CST	crystalline silicotitanate
CTS	Concentrate Transfer System
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DOE-HQ	U.S. Department of Energy-Headquarters
DOE-RL	U.S. Department of Energy's Richland Operations Office
DST	double-shell tank
DWPF	Defense Waste Processing Facility
ECR	effective cleaning radius
EIS	Environmental Impact Statement
EM	Office of Environmental Management
EM-30	Office of Waste Management
EM-50	Office of Science and Technology
EMSP	Environmental Management Science Program
EPA	U.S. Environmental Protection Agency
ESP	Efficient Separations Program
ESW	enhanced sludge washing
FFA	Federal Facility Agreement
FY	fiscal year
HAW	high activity waste
HEPA	high-efficiency particulate air
Hg	mercury
HLLWE	High-Level Liquid Waste Evaporator

HLW	high-level waste
HLWSC	High-Level Waste Steering Committee
HTI	Hanford Tanks Initiative
ILAW	immobilized low activity waste
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IPABS	Integrated Planning, Accounting, and Budgeting System
IPL	Integrated Priority Listing
ITP	in-tank precipitation
LAW	low activity waste
LDUA	Light Duty Utility Arm
LDR	land disposal restriction
LET&D	liquid effluent treatment and disposal
LLW	low-level waste
LVDG	Low Volume Density Gradient
MAXT	maximum achievable control technology
MMT	multiple metals
MOU	memorandum of understanding
MPC	Main Process Cell
MVST	Melton Valley Storage Tank
MYPP	Multiyear Program Plan
NDE	non-destructive examination
NGLW	newly-generated liquid waste
NTS	Nevada Test Site
NWCF	New Waste Calcine Facility
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
ORWBG	Old Radioactive Waste Burial Ground
OST	DOE's Office of Science and Technology
PBS	project baseline summary
PE	problem element
PEG	Program Execution Guidance
PEWE	Process Evaporative Waste Evaporator
PHMC	Project Hanford Management Contractor
PIC	products of incomplete combustion
PNNL	Pacific Northwest National Laboratory
PTC	Paths to Closure

R&D	research and development
RAL	Remote Analytical Laboratory
RCRA	Resource Conservation and Recovery Act
RH-TRU	remote handled-transuranic (waste)
Sr	strontium
SREX	strontium extraction
SRS	Savannah River Site
SST	single-shell tank
STCG	Site Technology Coordination Group
SVOC	semivolatile organic compound
TAG	(TFA's) Technical Advisory Group
Tc	technetium
TDS	total dissolved solids
TFA	Tanks Focus Area
TIM	(TFA's) Technology Integration Manager
TPA	*Hanford Federal Facility Agreement and Consent Order* (also known as the Tri-Party Agreement)
TPB-	tetraphenylborate ion
TRU	transuranic (waste)
TRUEX	transuranic extraction
TSD	Treatment, Storage and Disposal
TSR	Technical Safety Requirement
TSS	total suspended solids
TTP	technical task plan
TTP	telescoping transfer pump
TWRS	Tank Waste Remediation System
UDS	undissolved solids
UK	United Kingdom
USG	(TFA's) User Steering Group
VOC	volatile organic compound
WAPS	Waste Acceptance Product Specifications
WASRD	Waste Acceptance System Requirements Document
WIPP	Waste Isolation Pilot Plant
WVDP	West Valley Demonstration Project

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Section 1 - Introduction

This report documents the process used by the Tanks Focus Area (TFA) to analyze and develop responses to technology needs submitted by five major U.S. Department of Energy (DOE) sites with radioactive tank waste problems, and the initial results of the analysis. The sites are the Hanford Site, Idaho National Engineering and Environmental Laboratory (INEEL), Oak Ridge Reservation (ORR), Savannah River Site (SRS), and West Valley Demonstration Project (WVDP).

This is the fifth edition of the TFA site needs assessment. As with previous editions, this edition serves to provide the basis for accurately defining the TFA program for the upcoming fiscal year (FY), and adds definition to the program for up to 4 additional outyears. Therefore, this version distinctly defines the FY 2000 program and adds further definition to the FY 2001 - FY 2004 program. Each year, the TFA reviews and amends its program in response to site users' science and technology needs.

Overall, the TFA's annual program development cycle involves the

- Collection of site needs
- Needs analysis
- Development of technical responses and initial prioritization
- Refinement of the program for the next FY
- Formulation of the Corporate Review Budget (CRB)
- Preparation of Program Execution Guidance (PEG) for the next FY
- Revision of the multiyear program plan (MYPP).

This document describes the TFA's process of collecting site needs, analyzing them, and developing technical responses to the sites. It also summarizes the information captured within the TFA needs database, including information provided by five major DOE sites with tank waste problems. The technical scope of the TFA's 5-year program will be defined in detail with the publication of the companion to this document, the MYPP.

The TFA goal remains unchanged -- to provide integrated solutions that will accelerate safe and cost-effective cleanup and closure of DOE's tank system. At the five major tank waste

sites, the TFA focuses on the 282 tanks[1] that contain approximately 380,000 m^3 of high-level waste (HLW), low-level waste (LLW), and transuranic (TRU) waste. There are a number of smaller tanks at these sites that are outside of the TFA's purview at this time. The varying tank structure, construction, and capacity, as well as the different waste types themselves, provide an extraordinary challenge to the formation of an integrated tanks science and technology program. Multiple programmatic, institutional, and regulatory issues across the five sites add to the complex-wide challenge of remediation.

The overall TFA program objective is to deliver a tank science and technology program that reduces the current cost and the technical, operational, and safety risks of tank remediation. The TFA continues to enjoy close, cooperative relationships with each site. During the past year, the West Valley Demonstration Project (WVDP) became the fifth tank waste site to join the family of TFA user sites. The TFA is working hard to learn more about WVDP through site visits and regular communications. The TFA is placing particular emphasis on increasing the multi-site benefit of science and technology development and implementation by including WVDP in relevant technical responses.

The TFA continues to emphasize technical assistance and integration activities. These activities are essential, especially considering the dynamic environment at several sites. New or amended site needs frequently arise, requiring the TFA to be prepared not only to amend its program in response, but also to help the sites arrive at the best technical approach to solve revised site needs. Additionally, as the results of technology development are not 100% guaranteed, the TFA must be able to work with the sites to find appropriate alternative solutions if technology development and deployment results do not meet expectations.

Since its inception, the TFA continues to cite four tanks technology program attributes essential for TFA success. These attributes continue to guide the TFA's service to the user, such that the program is

- Applicable - addresses users' needs and can be implemented within budget, schedule, and regulatory constraints. The TFA uses a consensus-driven site needs collection and technical response process that enhances a deeper understanding of the interrelationships of the needs. Through this process, the TFA developed a priority listing of FY 2000 and FY 2001 proposed activities in accordance with representatives from all five major tank waste sites.

- Integrated - leverages relevant activities across the DOE Office of Environmental Management (EM) system and, later, across the DOE complex and beyond. The TFA is part of a science and technology network that has formed within the Office of Science and Technology (OST) and Environmental Management (EM) at each site. The awareness of related work between sites and focus areas continues to grow. The TFA continues to develop this awareness by leveraging opportunities. Under the "Focus Area-

[1] In 1997, two of these tanks were closed.

Centered" concept, the TFA is making a concerted effort to more fully integrate resources available from all other Office of Science and Technology (OST) activities.

- Acceptable - has broad involvement of key stakeholders and incorporates expertise from outside the laboratory system, e.g., from industry and universities as appropriate. The TFA has made special efforts to involve stakeholders. These stakeholders include the Site Technology Coordination Groups (STCGs), and the TFA User Steering Group (USG).
- Accountable - performs within budget, on schedule, and produces a clear benefit. The TFA continues to execute its mission with a high degree of accuracy, both fiscally and within milestone schedules. As a result, the TFA has gained the confidence of users and sites.

The TFA accomplishes its objective by executing an iterative approach to program development that involves site users and stakeholders through the STCGs at each site. The needs assessment forms the basis for TFA program definition. As previously noted, the TFA's program development cycle begins with the collection of site needs and ends with the publication of the MYPP. This site needs assessment describes the TFA's efforts through the first part of this cycle, from site needs collection through the development of technical responses and their initial prioritization. The TFA uses six steps to accomplish the first part of this cycle, which are listed below and depicted in Figure 1.1:

- STCG needs submission and TFA screen
- Needs analysis
- Strategic task identification
- Technical response development
- Response evaluation
- TFA Management Team prioritization.

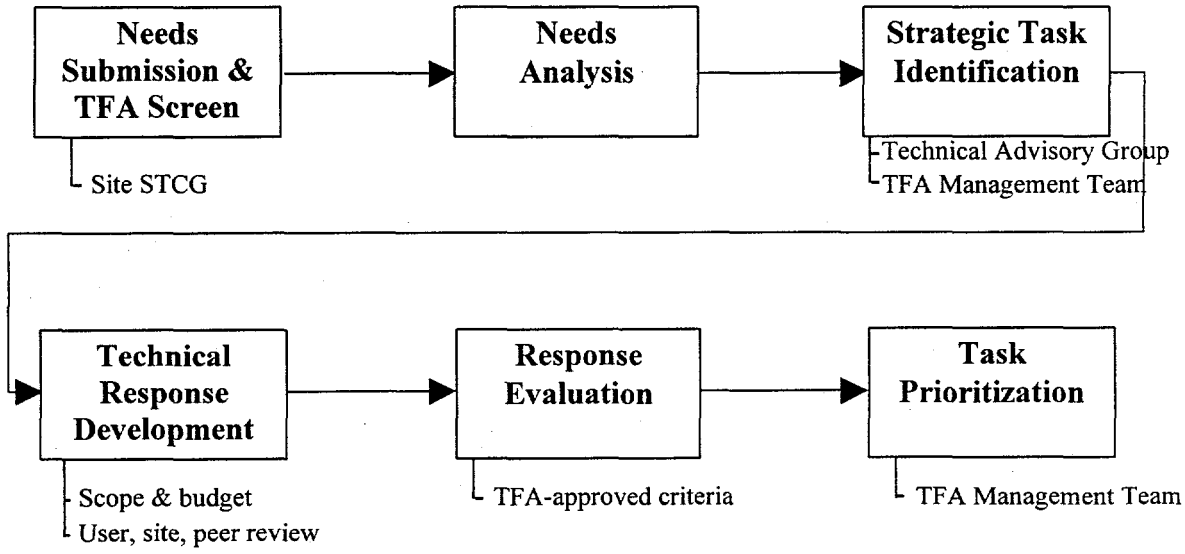

Figure 1.1. FY 1999 Tanks Focus Area Technical Response Development Process

At the date of this document's publication, the TFA Management Team had approved the results of their prioritization of TFA tasks for FY 2000 and FY 2001. Work is underway to finalize the technical responses developed earlier and to prepare the FY 2001 CRB. The final technical responses will form the basis for Program Execution Guidance (PEG) development required for execution of the FY 2000 program.

Section 2 of this site needs assessment describes the TFA's process in reaching this point, from needs collection and analysis to task prioritization. Section 3 describes follow-on program development activities the TFA will use to complete this year's program development process cycle. Appendix A contains a summary of the needs submitted by the sites and the TFA's initial disposition of them through technical responses and prioritization.

Section 2 – Site Needs Assessment and Technical Response Development Process

The TFA seeks continuous improvement of its annual site needs assessment and technical response development process. In November 1998 at the TFA FY 1999 Kickoff Meeting held in Las Vegas, Nevada, the TFA examined in detail each process step used in the previous year. Some modifications were made to the process, with significant consideration given to the TFA's task prioritization criteria. Highlights of these changes are provided below. In considering the changes, the TFA kept several objectives in mind:

- Increased user participation
- Assurance of prompt communication between the TFA and users
- Recognition of the DOE-Headquarters (DOE-HQ) planning process (e.g., Accelerated Cleanup - Paths to Closure Plan)
- Development of strategic needs and technical responses.

The process steps are (refer Figure 1.1)

- STCG needs submission and TFA screen
- Needs analysis
- Strategic task identification
- Technical response development
- Response evaluation
- TFA Management Team prioritization.

2.1 STCG Needs Submission and TFA Screen

The tank waste sites submitted their technology development needs via the STCGs as done in FY 1998. As with last year, each site used its own internal process to determine and prioritize their site needs as necessary. The standardized site needs template again proved helpful in communicating and understanding the needs. The TFA's Site Representatives were essential in communicating the needs from the sites to the TFA. (See Figure 2.1, Tanks Focus Area Organization.) This year, the sites, in general, communicated their science and technology needs statements earlier than in any previous year. The TFA appreciated these earlier submissions, which provided additional time to integrate the information with other OST program activities.

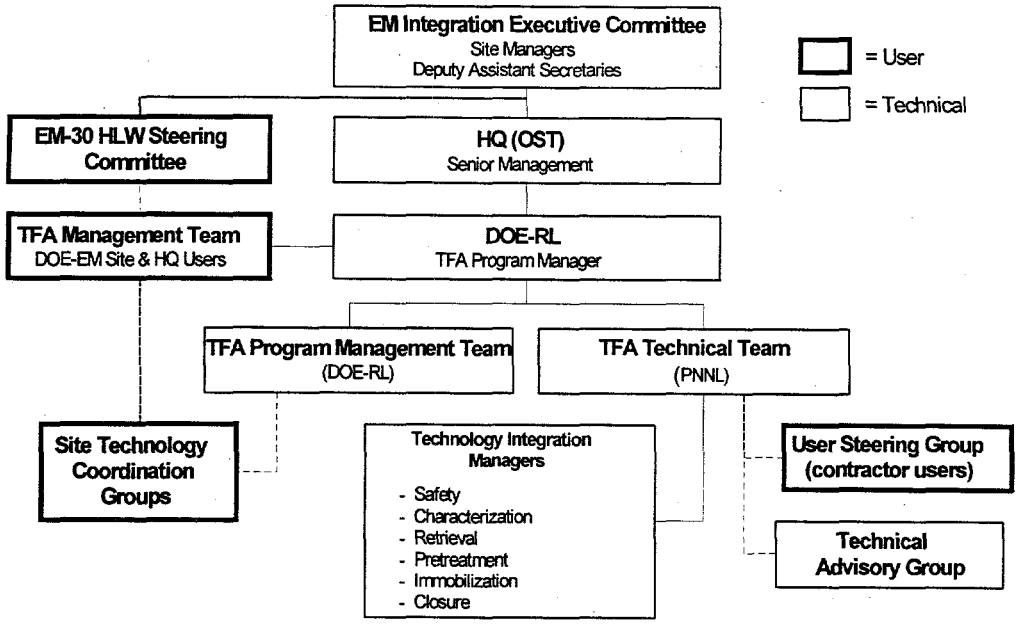

Figure 2.1. Tanks Focus Area Organization

Each need was subjected to an initial needs screening. The screening assessed whether or not the need and possible technical response

- Was within the TFA mission area
- Required a technology development component
  - Development, first-time hot demonstration or deployment, re-engineering, etc., was required
  - Technology was available, and no technology development was required
- Was technically feasible (schedule or cost).

2.2 Needs Analysis

The TFA analyzed each site need that passed through the screening criteria. This analysis served to familiarize the TFA with the general scope of site needs. The TFA worked interactively with the sites to better understand the problem to be solved, required performance specifications, timing of the technical solution, integration of functional interfaces (e.g., between pretreatment and immobilization), and interfaces with other OST programs.

2.3 Strategic Task Identification

Focusing predominately on the analysis of site-submitted needs, the TFA identified needs whose solutions would be strategic in nature to the TFA. Additionally, the TFA identified technology "gaps" that became apparent in the needs analysis, or that were identified through other TFA processes, such as technology interface workshops. The TFA Advisory Group (TAG) provided advice and guidance on the identification and scope of proposed strategic tasks. The TFA submitted these issues for review by its TFA Management Team, and eventually to the High-Level Waste Steering Committee (HLWSC). The TFA Management Team either voiced no objection to the development of a technical response to these issues to be included within the TFA list of needs, or determined that the issue merited no further TFA consideration. Unfortunately, the TFA did not have sufficient time to fully coordinate potential input from the HLWSC.

The TFA developed and refined its own definition of a strategic. The following points define a TFA strategic task

- Pursues a problem identified within a site baseline, but not currently being addressed. This problem would be longer-term and may otherwise go unsatisfied due to budget limitations and priority. An official need may or may not have been submitted by the STCG of a specific site. (Example: Hanford Tanks Initiative's work on the performance objectives and decision process for tank closure. HTI was initiated as a strategic investment.) Successful TFA response to the need may result in

    - Accelerated schedule
    - Risk reduction (programmatic or technical)
    - Establishment of a technical or programmatic basis that drives near-term related baseline efforts.

- Resolves a technical roadblock or problem that has recently been identified. This problem may be near- or long-term in nature, and may or may not be associated with baseline technologies or flowsheets. This problem may be identified by the TFA or external reviewers, rather than officially submitted as a need by a specific site. (Example: TFA's work in the prevention of solids formation for Hanford waste retrieval and transfer, especially for feed delivery for privatization. This was not originally submitted as a site need until identified as a potential roadblock or technical risk based on test results from other EM-30 and -50 work.) Satisfaction of this need may result in

    - Prevention of recently identified problems
    - Technical contingency through identification of another viable technical approach
    - Risk reduction (programmatic or technical).

- Effects a change to a baseline (alternative). The problem could be near-term and may require that the TFA leverage other programs. An official need may or may not have been submitted by a site. (Example: TFA's early work in cesium alternatives for SRS via the Efficient Separations Program [ESP]. This work provided alternatives for

consideration in the salt disposition project). Successful response to the need may result in

- Mortgage reduction
- Risk reduction (programmatic or technical).

The TFA still seeks wide support for the concept of selective identification and funding of strategic tasks. While extremely limited funding may inhibit the TFA's ability to initiate new start strategic activities in the immediate future, discussion of the strategic task concept still proves very useful, philosophically, for the TFA. The TFA intends to continue the pursuit of this concept in the future.

2.4 Technical Response Development

The TFA developed technical responses to all needs passing through the screening criteria. Those needs screened out were coordinated with the submitting site for further disposition. Some needs were screened out as potentially outside of the TFA mission area. These needs may best be addressed within a different OST program, such as another focus area. In such cases, the TFA interacts in such cases with the other programs and informs the submitting site STCG of any need identified as such in this process.

The responses were prepared by the Technical Team and submitted to the Technical Advisory Group (TAG), USG, and TFA Management Team for review and comment. To the maximum extent possible, the TFA integrated responses to similar needs. Also, the TFA was careful to take advantage of other OST funding sources to maximize leveraging opportunities.

The TFA uses an established standard framework to begin its annual program planning process. This framework groups similar or related site needs and the TFA's technical responses, allowing for technical integration across functions to solve specific problems, as opposed to consolidating needs by technical focus. This activity begins the transition from needs collection and analysis to TFA program development. The results of the program development process will be addressed in the upcoming revision to the MYPP scheduled for publication in September 1999.

To establish and maintain this program planning framework, the TFA uses its problem element structure. The problem elements

- Provide an updated method to logically group site needs and TFA technical responses
- Assist in sequencing and scheduling integrated technical solutions
- Identify the problem elements and the needs within them as baseline, enhancements, or alternatives.

The TFA FY 1999 problem element structure appears in Table 2.1.

Table 2.1. Problem Element Structure

PE#	Problem Element
1.1	Store Waste
1.1.1	Extend Tank Life
1.1.1.1	Monitor Tank Integrity/Avoid Corrosion
1.1.1.3	Remediate Loss of Tank Integrity
1.1.2	Ventilate Tanks
1.1.3	Characterize Waste
1.1.3.1	Characterize Waste In Situ
1.1.3.2	Sample Waste
1.1.3.3	Analyze Waste
1.1.4	Reduce Waste Volume
1.1.4.1	Reduce Source Streams
1.1.4.2	Reduce Recycle Streams
1.2	Process Waste
1.2.1	Retrieve Waste
1.2.1.1	Deploy Equipment
1.2.1.2	Mobilize Bulk and Heel Wastes
1.2.1.4	Transfer Waste
1.2.1.5	Detect and Mitigate Leaks
1.2.1.6	Monitor and Control Retrieval Process
1.2.1.7	Integrate Retrieval and Pretreatment Technology Systems
1.2.1.8	Mobilize Heel
1.2.2	Pretreat Waste
1.2.2.1	Calcine Waste
1.2.2.2	Dissolve Waste
1.2.2.3	Prepare Retrieved Waste for Transfer and Pretreatment
1.2.2.4	Clarify Liquid Stream
1.2.2.5	Remove Radionuclides
1.2.2.6	Integrate Pretreatment and LLW Immobilization Technology Systems
1.2.2.7	Process Sludge
1.2.2.8	Prepare Pretreated Waste for Immobilization
1.2.2.9	Monitor and Control Pretreatment Process
1.2.3	Immobilize Waste
1.2.3.1	Process LLW
1.2.3.1.1	Monitor and Control LLW Immobilization Process
1.2.3.1.2	Prepare LLW Feed
1.2.3.1.3	Immobilize LLW Stream
1.2.3.1.4	Treat LLW Offgas
1.2.3.1.5	Dispose of LLW
1.2.3.2	Process HLW
1.2.3.2.1	Monitor and Control HLW Immobilization Process
1.2.3.2.2	Prepare Secondary Waste from Pretreatment
1.2.3.2.3	Prepare Sludge Feed
1.2.3.2.4	Immobilize HLW Stream
1.2.3.2.5	Treat HLW Offgas
1.3	Store Waste Forms and Close Tanks
1.3.1	Close Tanks
1.3.1.1	Monitor Tank
1.3.1.2	Characterize Heels
1.3.1.3	Define Closure Criteria
1.3.1.4	Treat Supernate in Place
1.3.1.5	Treat Heel in Place
1.3.1.6	Detect Leaks
1.3.1.7	Stabilize Tank for Closure
1.3.1.8	Monitor Site
1.3.2	Dispose of LLW
1.3.2.1	Monitor LLW for Acceptance
1.3.2.2	Determine Performance of Waste Form
1.3.2.3	Provide Disposal System
1.3.3	Store and Dispose HLW
1.3.3.1	Provide Interim Storage HLW
1.3.3.2	Provide Shipping Facilities
1.3.3.3	Monitor HLW for Acceptance
1.4	Decontamination and Decommissioning

2.5 Technical Response Rating

The TFA rated each technical response for use in funding decisions based on approved task selection criteria. Technical responses rated above the anticipated funding line are known as "core" tasks and generally form the basis for "target" budget funding levels. Selected technical responses below the funding line may be considered for TFA funding if they were previously identified as a strategic task. These strategic tasks will be highlighted for Management Team review and prioritization with rationale describing the benefits of investments relative to the TFA's strategic intent.

The TFA studied each need and developed draft integrated technical responses. As necessary, the TFA contacted the specific need technical point of contact for further clarification. From mid-January through early-March 1999, the TFA prepared an initial draft response for each need. The composite set of technical responses was rated against criteria intended to rank them for further program development activities. The criteria included the following:

- Broad-based benefit
- User commitment to deploy
- Relationship to Paths to Closure
- Other technical impact
- Implementation potential.

Broad-Based Benefit - This criterion addressed the potential complex-wide benefit of a technical response.

High: *Two* or more different site STCG-submitted needs with strong interest in a single, integrated response. Note: "strong interest" means site interest is confirmed with the TFA Site Representative and USG member.

High to Medium:

- High/Medium: One STCG-submitted need; two or more sites with strong interest where resulting hardware or data would *directly* benefit.
- Medium/High: One STCG-submitted need; one site with strong interest where resulting hardware or data would *directly* benefit.
- Medium: One STCG-submitted need; one site with strong interest where resulting hardware or data would *indirectly* benefit.

Medium Low: One STCG-submitted need that may be satisfied through deployment of a technology already deployed elsewhere, but still requiring technology development work.

Low/Medium: One STCG-submitted need and one other potential benefiting site based on Technology Integration Manager (TIM) judgment.

Low: One STCG-submitted need; site specific.

User Commitment - The TFA values user commitment to the development and deployment of technical solutions. This criterion assesses the strength of user commitment to share the burden of a technology's development and deployment.

High:

- Site co-funds development and demonstration (or deployment)
- High commitment to deploy through out-year baseline, PBS, and budget request; memorandum of understanding (MOU) or other signed document for TFA next year expenditures over $1M
- Is in site baseline operational plan with MOU or other signed document committing to funding and plan for deployment in subject FY
- Deployment within 1 - 2 years
- Greater than or equal to co-funding of development and demonstration for the year of prioritization and duration of the response.

High/Medium: Response results in data delivery for key DOE decisions, e.g., Environmental Impact Statement (EIS) or privatization decisions.

- Site co-funds data development and delivery
- Data will be used within 1 - 2 years
- High commitment to deploy through out-year baseline, PBS, and budget request; MOU or other signed document for TFA expenditures over $1M
- Greater than or equal to co-funding of development and delivery for the year of prioritization and duration of the technical response.

Medium/High: Approximately equal co-funding to develop and demonstrate during time of the technical response. High commitment to deploy through out-year baseline, PBS, and budget request; TFA Site Representative commitment to obtain MOU or other signed document for TFA next year expenditures over $1M.

Medium: Approximately one-quarter co-funding; high commitment to deploy through out-year baseline, PBS, and budget request; TFA Site Representative commitment to obtain MOU or other signed document for TFA next year expenditures over $1M.

Low/Medium: Some co-funding (large percentage or small), but with no commitment to deploy or use data (not in out-year plan).

Low: Little or no indication of site co-funding or commitment to deploy.

Note on co-funding: Co-funding must focus on support to the overall project TFA is funding. Co-funding may include direct support the principal investigator, support to on-site operations staff to facilitate testing, sample collection/analysis/shipping, design and review. Examples of co-funding include ORR Gunite and Associated Tanks cold testing support, and SRS Tank 20 closure (application of TFA-funded grout test work).

Relationship to Paths to Closure - This criterion considers the Paths to Closure (PTC) priority, critical path milestone risks, and waste stream risks related to a technical response.

Paths to Closure Priority

- High: Technical response addresses at least two needs with a PTC priority of 1, or three needs with a PTC priority of 2.
- Medium: Technical response addresses at least one need with a PTC priority of 1, or two needs with a PTC priority of 2.
- Low: Technical response addresses at least one need with a PTC priority of 2. (Note: no value is assigned to a technical response addressing needs with a PTC priority of 3.

Paths to Closure Risk

- High: Must meet one of two conditions: 1) related critical path milestone technology risk or critical path milestone work scope definition risk is high (risk rating of 4 or 5), or 2) related waste stream technology risk or waste stream work scope definition risk is high (risk rating of 4 or 5).
- Medium: Must meet one of two conditions: 1) related critical path milestone technology risk or critical path milestone work scope definition risk is medium with a risk rating of 3, or 2) related waste stream technology risk or waste stream work scope definition risk is medium with a risk rating of 3.
- Low: Must meet one of two conditions: 1) related critical path milestone technology risk or critical path milestone work scope definition risk is medium or low with a risk rating of 2 or 1, or 2) related waste stream technology risk or waste stream work scope definition risk is medium or low with a risk rating of 2 or 1.

Other Technology Impact - The objective of this criterion is to broadly assess the overall potential technology impact of a technical response. The TFA considers a response's impact on schedule, cost avoidance, and link to regulatory requirements to determine impact. The ratings include the following:

High: (one or more of the following apply)

- Technology required to meet baseline assumptions in the Paths to Closure

- Documented high cost avoidance (over $250M) to EM (information must be provided to TFA by site with uncertainty analysis)

- Possesses high cost reduction potential (over $250M)

- Technical response is required to meet firm regulatory requirements that could delay tank waste remediation schedules.

Medium: (one or more of the following apply)

- Technology required to meet enhancements or alternatives to baseline in Paths to Closure

- Documented moderate cost avoidance (between $250M and $50M) to EM or general consensus on high cost avoidance (over $250M) that cannot be documented due to lack of data that will be developed if the task goes forward

- Possesses moderate cost reduction potential

- Technical response adds assurance that regulatory requirements are met, or supports a regulatory requirement that the site may renegotiate.

Low: (one or more of the following)

- Appears that technology could meet baseline or enhancement assumptions, but more data is needed and will be provided explicitly if the task proceeds

- General consensus that moderate cost avoidance (between $250M and $50M) could be achieved but cannot yet be documented

- The technical response's link to regulatory requirements is not fully determined.

Implementation Potential - This criterion values a strategic task that has the potential to result in an implementation.

High: No barriers, technical or otherwise, are believed to exist that would prohibit development and implementation of a solution to the problem prior to the required date.

Medium: No technical barriers are believed to exist that would prohibit development and implementation of a solution to the problem prior to the required date. Other barriers may exist, such as political, stakeholder, regulatory or programmatic.

Low: No barriers are believed to exist that would prohibit development and implementation of a solution to the problem, however the required date cannot be met.

In March 1999, the TFA evaluated each technical response using the approved criteria. This initial assessment was accomplished in a group consensus of TIMs, monitored by the TFA Program Management Team. The TFA's intent was to ensure that technical responses would

- Be provided for each need received
- Contain an explanation of the priority of the response according to either
  - Screening criteria
  - Prioritization criteria
- Describe multiyear intent
  - 4-year budget estimate (current + 3 years)
  - Basis of estimate
- Describe the intended scope (2 to 3 paragraphs)
- Identify the relationship or benefit to other site needs.

2.6 TFA Management Team Prioritization

The TFA technical response prioritization took place on March 25, 1999 in conjunction with TFA Midyear activities. During prioritization, the TFA Technical Team introduced each technical response to the TFA Management Team. The Management Team discussed the merits of each response, focusing closely on aspects of site benefits and user commitment, and assigned scores to each technical response according to the approved prioritization criteria. At the conclusion of the prioritization session, the Management Team affirmed the results, thereby creating the official TFA FY 2000-2001 Integrated Priority Listing (IPL).

As of the publication date of this document, the TFA is finalizing the technical responses to incorporate actions directed by the Management Team during prioritization. The final version of the technical responses will be posted on the Technical Team home page (http://www.pnl.gov/tfa) in the near future.

2.7 Data Summary

In all, the TFA received 98 technology needs. The TFA assigned each need to one of the TFA's six functional areas based on the major subject area of the need. Some needs statements were broad enough that they required action in more than one technical response. In all, 50 technical responses were prepared by the TFA. A summary of the TFA's functional assignment of needs and technical responses by site is shown in Table 2.2.

Table 2.2. Summary of Site Needs Submitted to the Tanks Focus Area

	Hanford	INEEL	ORR	SRS	WVDP	Total
Safety	4	2	1	2	1	10
Characterization	3	8	1	1	1	14
Pretreatment	2	13	2	4	0	21
Immobilization	4	11	1	4	2	22
Retrieval	7	1	2	6	2	18
Closure	4	6	1	1	1	13
Total	24	41	8	18	7	98

The needs across the complex reflect requirements to

- Monitor tank integrity and tank corrosion
- Reduce waste volumes and minimize the generation of additional wastes, including secondary wastes
- Sample and characterize the chemical and physical properties of the wastes
- Retrieve salt and sludge wastes and tank heels
- Optimize waste loadings in glass waste forms
- Establish criteria and methods for closing tanks at the end of their useful life.

ORR requires additional technologies for closing small tanks. Hanford requires continued emphasis on determining the impacts of waste chemistry on waste retrieval and transport. Hanford and SRS require additional mixing technologies to suspend sludges and saltcake for waste removal. SRS requires technical data to support the design and implementation of an alternative to the in-tank precipitation process for radionuclide removal. As waste storage and processing facilities mature, technologies are needed for remote maintenance and repair and to optimize equipment design for improved operations. INEEL needs technical data to support process selection and design and their EIS. WVDP and SRS require improved technologies for HLW canister decontamination. Hanford needs additional data and tools to support waste disposal system performance assessments.

During its analysis of the site needs, the TFA found that many of the requirements from any one site have multi-site benefit. The TFA will exploit the resolution of these requirements to leverage these multi-site benefits. Multi-site benefit is one of the four criteria the TFA used this year in prioritizing future work. The tentative program for FY 2000 - FY 2001 reflects the importance the TFA places on multi-site benefit.

2.8 Lessons Learned

Every year, the TFA learns new lessons in executing the initial stages of the program development process. Last year, the TFA noted that the needs submission schedule should be refined to permit more time to analyze needs, closely integrate with other OST programs,

and prepare more complete technical responses in preparation for prioritization. This year, several sites responded favorably by submitting their needs earlier in the fiscal year, mostly in October-November 1998. This was essential in the TFA gaining more understanding and practice in the focus area-centered approach. While great progress was made in working with the crosscutting, university, and industry programs, the TFA desires to greatly increase its program development interactions with these programs.

As program development activities progressed, there became more demands on integrating the Environmental Management Science Program (EMSP). More work is required to define EMSP in light of the focus area-centered concept. Until that is done, the TFA will continue to struggle to integrate basic and applied science solutions to user needs. For the FY 2000 planning cycle, the TFA plans to analyze all high-level tank waste science needs for potential technical response.

The timing of certain corporate program development activities created problems during the front end of this year's program development cycle. DOE's decision to initiate new database systems as part of the Integrated Planning, Accounting, and Budgeting System (IPABS) required site users and the TFA to produce data and documentation supporting the FY 2001 CRB too early in the program development process. It also revealed possible widespread data quality issues, notably in the documentation of waste streams. This affected the TFA's prioritization of technical responses, in that waste stream risk data was likely out-of-date, critical path milestone information was unavailable, and project baseline summaries (PBSs) had not been revised. The TFA will do its part to correct these timing and data quality issues to support next year's corporate budgeting activities.

Section 3 – The Next Process Steps

As noted earlier, this document reports only on the initial program development steps. Formulation of the final detailed technical response for each submitted need is in progress. The first phase of the FY 2001 Corporate Review Budget (CRB) development is completed. The purpose of this section is to describe how the activities covered in this site needs assessment fit into the overall program development process and to provide a short description of the remaining program development activities. Within the overall program development process, the following major tasks and schedule remain for this year's program development cycle:

- Finalize FY 2001 CRB submittal (May 1999)
- Office of Science and Technology work package prioritization for the FY 2001 CRB (May 1999)
- Prepare and submit FY 2000 program execution documents (June-August 1999)
- Prepare Multiyear Program Plan (MYPP) (September 1999)
- High-Level Waste Steering Committee (HLWSC) approval of MYPP (October 1999).

3.1 Finalize FY 2001 CRB Submittal

The TFA is completing preparation of its FY 2001 CRB budget input based on the prioritized technical responses to site needs. The TFA groups technical responses by functional subject area and TFA priority into "work packages." Work packages are the main components of the TFA's CRB.

3.2 Office of Science and Technology (OST) Work Package Prioritization for the FY 2001 CRB

OST will rate each focus area work package according to pre-established criteria. Presently, these criteria value the number of sites served in a work package, number of PBSs represented, potential cost savings, likelihood of technology deployments, and risk reduction. The result of the rating is a prioritized list of work packages for DOE management consideration within expected available funding. The TFA supports the prioritization activity by ensuring the most accurate data is available.

3.3 Prepare and Submit FY 2000 Program Execution Documents

Each year, the TFA uses two documents to provide for program execution. The first, the PEG, is the TFA's guidance to the selected work performers and is tied to the users' commitment and priority. This guidance states the mandatory technical and programmatic requirements needed for each task. The PEG is simply an expansion of the final technical responses that have been reviewed and approved by the TFA Management Team.

Upon receipt of the PEG, the performer develops the second document, the Technical Task Plan (TTP). The TTP is the performer's response to the PEG. An approved TTP constitutes a contractual arrangement between the TFA, the performing DOE Field Office, and the performing organization. Both documents are generally required before work initiation and funding authorization.

During the transition between PEG and TTP, the TFA will conduct a meeting to ensure site commitment to each technical response, that all performer selection issues have been resolved, and that the proposed scope and budget are understood fully by all.

3.4 Document in the MYPP

The companion document to this one is the TFA MYPP. It documents the results of the preceding planning steps and is the basis for complementary planning between OST and the Offices of Environmental Restoration and Waste Management in future years, which is reflected in the OST budget process. This approach is consistent with the TFA goal of defining and implementing an integrated technical program. The MYPP describes the TFA's technical strategies and the actions being taken to address the site needs within the strategies. The FY 2000 - FY2004 MYPP is expected to be published during September 1999.

Each year, the MYPP is updated to reflect the changing emphasis of the sites and the subsequent changes in the TFA's technical focus. Based on the FY 1999 STCGs' needs submittal and the resulting technical responses, the FY 2000 - FY 2004 MYPP should show the TFA's continuing emphasis to

- Provide technologies that support waste retrieval and tank closure at SRS, Hanford, INEEL, WVDP, and ORR
- Appropriately support DOE's privatization of tank waste management activities at Hanford and ORR
- Provide technical answers to vitrification requirements from around the complex
- Support development and implementation of the alternative to in-tank precipitation at SRS
- Support INEEL in process selection and design
- Provide technologies for monitoring tank integrity and corrosion.

WVDP joined the TFA this year. Their needs, focused on waste retrieval, tank closure, vitrification, and decontamination, are being addressed by the TFA.

Section 4 - Bibliography

Tanks Focus Area (TFA). 1998a. *Tanks Focus Area Site Needs Assessment FY 1998*, PNNL-11861. Pacific Northwest National Laboratory, Richland, Washington.

Tanks Focus Area (TFA). 1998b. *Tanks Focus Area Multiyear Program Plan FY99-FY03*, PNNL-11938. Pacific Northwest National Laboratory, Richland, Washington.

Appendix A – Site Needs Database

This appendix summarizes the 98 site needs submitted by the sites and the TFA's intended technical disposition of them. Table A.1 is a list of the needs received by each site and identification of the technical response or responses linked to that need. Table A.2 takes those same needs and aligns them within the TFA problem element structure. Additionally, Table A.2 lists the Paths to Closure priority assigned by the site to the need, and the functional area the TFA assigned to the need. Note that a need may occur more than once in the problem element structure. This is because a need may be broad enough that it is described best in more than one problem element, and therefore will likely appear in more than one technical response.

Table A.3 portrays the TFA's interpretation of the benefiting sites for each technical response. The technical responses are listed in the priority order established by the TFA Management Team.

The remainder of the appendix is devoted to the individual site needs. In past years, the Site Needs Assessment included full version copies of each site need. However, site needs statements have become so widely distributed electronically that reprinting needs within this document would be highly duplicative. Interested readers may find full versions of the site high-level tank waste needs at the following web sites:

- Hanford: http://www.pnl.gov/stcg/needs.stm
- INEEL: http://wylie.inel.gov/INEELSTCG/wt_select.asp?id=HLW
- ORR: http://www.em.doe.gov/usr-bin/techneed/qu/sg?stcg=TANKS&site=OAK+RIDGE+NATIONAL+LABORATORY&category=Any&contam=Any
- SRS: http://www.srs.gov/general/srtech/stcg/needstmt.htm
- WVDP: http://www.ohio.doe.gov/oh-stcg/needs.asp

Additionally, a comprehensive library of science and technology needs is found in EM's Needs Management System at: http://em-needs.em.doe.gov.

Instead, this appendix provides a brief summary of each site needs statement. The summaries were largely extracted from the actual needs statements found in the above web sites. Following the summary for each need is the number, title, and FY 2000 - FY 2001 TFA priority number for the technical response to that need. In several cases, the TFA responded to the need in more than one technical response.

Table A.1. Tanks Focus Area Needs Submitted by Sites

Site Need	Need Title	TFA Response ID
HANFORD		
RL-WT01	Technetium-99 Analysis in Hanford Tank Waste and Contaminated Tank Farm Areas	99064
RL-WT04	DST Corrosion Monitoring	99043
RL-WT05	Remote Inspection of High-Level Waste Single-Shell Tanks	99075
RL-WT06	Identification and Management of Problem Constituents for HLW Vitrification	99073
RL-WT09	Representative Sampling and Associated Analysis to Support Operations	99046
RL-WT013	Establish Retrieval Performance Evaluation Criteria	99047A, 99067, 99101
RL-WT015	Standard Method for Determining Waste Form Release Rate	99048
RL-WT016	Glass Monolith Surface Area	99049
RL-WT017	Long-Term Testing of Surface Barrier	99050, 99102
RL-WT018	Testing of Sand-Gravel Capillary Barrier	99050, 99102
RL-WT021	Cleaning, Decontaminating and Upgrading Hanford Pits	99052
RL-WT022	Tank Knuckle NDE	99075
RL-WT023	Prediction of Solid Phase Formation in Static and Dynamic Hanford Tank Waste Solutions	99054A, 99054B, 99055B, 99076
RL-WT024	Enhanced Sludge Washing Process Data	99055A, 99055B,
RL-WT026	Tank Leak Detection Systems for Underground Single-Shell Waste Storage Tanks (SSTs)	99057
RL-WT027	Tank Leak Mitigation Systems	99057, 99067, 99103
RL-WT029	Data and Tools for Performance Assessments	99058
RL-WT060	PHMC Retrieval and Closure - Hanford/SRS Waste Mixing Mobilization	99059
RL-WT061	Reactive Barriers to Contaminant Migration	99060, 99102
RL-WT062	PHMC DST Retrieval - Hanford DST Transfer Pump Improvements	99059
RL-WT063	PHMC Retrieval and Closure - Hanford SST Saltcake Dissolution	99054B, 99062
RL-WT064	PHMC Retrieval and Closure - Hanford Past Practice Sluicing	99067, 99103
RL-WT065	Direct Inorganic and Organic Analyses of High-Level Waste	99064, 99100
RL-WT066	Compositional Dependence of the Long Term Performance of Glass as a Low-Activity Waste Form	99048
INEEL		
ID-2.1.06	TRU, Cs and Sr Removal from High Activity Wastes	99001
ID-2.1.15	Neutralization of Newly Generated Liquid Wastes	99002
ID-2.1.16	Decon Facility/Analytical Facility Waste Reduction	99003, 99064, 99100
ID-2.1.17	Develop New Filter Leach Process	99003
ID-2.1.18	Continuous Emissions Monitor for Offgas Analysis	99005
ID-2.1.19	EPA Methods Sample Collection and Analysis Verification/Development	99006
ID-2.1.20	Tank Annulus/Vault Inspection	99075
ID-2.1.23	Low-Activity Waste Form Qualification	99019
ID-2.1.24	Integration/Optimization of High Activity Waste/Low Activity Waste Process Flowsheet	99009
ID-2.1.25	Ion-Exchange System for Water Runoff	99010
ID-2.1.26	Nested Array Fluidic Sampler for Tank Solution Characterization	99046
ID-2.1.27	Blowback Metal Filters for Solids (Calcine) Retrieval	99071
ID-2.1.28	Cs Removal from Newly Generated Liquid Waste	99019
ID-2.1.29	Evaluate Chloride Corrosion Potential (LET&D/PEWE/Future Processes)	99014
ID-2.1.30	Remove/Treat Chlorides (LET&D/PEWE/Future Processes)	99014
ID-2.1.31	Characterization of Entrainable Solids in Tank Waste	99016
ID-2.1.35	Direct Immobilization of INTEC Sodium-Bearing Waste	99019
ID-2.1.36	Mercury Removal from Liquid Wastes	99018
ID-2.1.38	Conditioning of Low Activity Wastes for Treatment	99019
ID-2.1.39	Acceptance Criteria for LAW Disposal in Underground Storage Tanks	99023
ID-2.1.40	Low Activity Waste Grout Sorbent Addition to Reduce Leachability	99019
ID-2.1.41	HLW Process Offgas Treatment	99022

Table A.1. Continued

Site Need	Need Title	TFA Response ID
ID-2.1.42	Acceptance Criteria for Tank Closure	99023, 99101
ID-2.1.43	Certify LDUA Sampler as EPA-Approved Method of Sampling Tank Heel Liquids	99046
ID-2.1.44	Certify LDUA Sampler as EPA-Approved Method of Sampling Tank Heel Solids	99046
ID-2.1.45	Acceptance Criteria for Grouting Tank Heels	99023
ID-2.1.46	Management of Tank Heel Liquids	99023, 99101
ID-2.1.47	Management of Tank Heel Solids	99023, 99067, 99101
ID-2.1.48	Waste Form Qualification for Low-Activity Waste in Underground Storage Tanks	99023
ID-2.1.49	Acceptance Criteria for High Activity Waste/Low Activity Waste	99030
ID-2.1.50	Solids Waste (Calcine) Retrieval	99031
ID-2.1.51	Develop Calcine Dissolution Kinetics for Solid/Liquid Equilibria	99032
ID-2.1.52	Characterization of Solids from Calcine Dissolution	99016
ID-2.1.53	Cs Removal from High Activity Wastes	99001, 99098
ID-2.1.54	TRU Removal from High Activity Wastes	99001
ID-2.1.55	Sr Removal from High Activity Wastes	99001
ID-2.1.56	Mercury Treatment for Aluminum Calcine	99018
ID-2.1.57	Conditioning of HAW for Treatment	99068
ID-2.1.58	HAW Immobilization	99068, 99073, 99099
ID-2.1.62	Acceptance Criteria for Bin Set Closure	99023
ID-2.1.63	Universal Solvent Process for TRU, Cs and Sr Removal	99041, 99098
ORR		
OR-TK-01	Tank Waste Characterization	99043, 99075
OR-TK-02	Tank Solid Waste Retrieval	99052, 99054A, 99067, 99082
OR-TK-03	Sludge Mixing and Mobilization	99082
OR-TK-04	Sludge Mixing and Slurry Transport	99078, 99084
OR-TK-05	Tank Sludge and Supernatant Separations	99084
OR-TK-06	Tank Sludge Supernatant Immobilization	99019
OR-TK-09	Tank Closure	99085, 99101
OR-TK-11	Tank Supernatant Pretreatment	99086
SRS		
SR99-1011	Demonstrate Evaporation Technologies to Reduce Generation of Secondary Waste Volume from Consolidated Incineration Facility	99086
SR99-2027	Demonstrate Alternative Filtration Technologies to Replace HEPA Filters	99071
SR99-2028	Alternative Waste Removal Technology	99059
SR99-2029	Alternative DWPF Canister Decon Technology	99072
SR99-2031	Develop Remote Technology to Improve DWPF Operations	99074
SR99-2032	Optimize Melter Glass Chemistry	99073
SR99-2033	Provide Alternative Processing and/or Concentration Methods for DWPF Recycle Aqueous Streams	99066
SR99-2034	Second Generation Salt Feed Preparation	99070, 99098
SR99-2035	Develop Advanced Techniques for Life Extension of High Level Waste Tanks and Piping	99075, 99076
SR99-2036	Develop Second Generation DWPF Melter	99068
SR99-2037	Tank Heel Removal/Closure Technology	99052, 99059, 99067, 99078
SR99-2039	Methods to Unplug Waste Transfer Lines	99054A, 99076
SR99-2040	Demonstrate Remote Decommissioning and Disassembly of High Level Waste Processing Equipment	99052, 99077
SR99-2041	Demonstration of Alternative Mixer Technology for HLW Pump Tanks	99059
SR99-2044	Demonstrate In-Situ Characterization Weight Percent Probe	99078

Table A.1. Tanks Focus Area Needs Submitted by Sites

Site Need	Need Title	TFA Response ID
SR99-2045	In-Situ Waste Tank Corrosion Probe	99043
SR99-2051	Technology to Mitigate Effects of Technetium Under Tank Closure	99060, 99088B
SR99-3022	In-situ Grouting and/or Retrieval of waste from Underground Tanks	99082, 99085
WVDP		
OH-WV-902	Decontamination of High-Level Waste (HLW) Canisters	99072
OH-WV-903	Vitrification Expended Material Processing	99077
OH-WV-904	High Level Waste Tank Closure	99085
OH-WV-905	Retrieval of Tank Heels	99067
OH-WV-906	Radioactivity Measurement of High-Level Waste Tank Residuals	99095
OH-WV-907	Leak Mitigation for High-Level Waste Tanks	99057
OH-WV-908	Decontamination of High-Level Waste Contaminated Equipment	99052

Table A.2. Tanks Focus Area Site Needs Distributed within the Problem Element Structure

PE#	Problem Element Title		Site	PTC Priority	Function
1.1	**Store Waste**				
1.1.1	**Extend Tank Life**				
1.1.1.1	**Monitor Tank Integrity/Avoid Corrosion**				
	OR-TK-01	Tank Waste Characterization	ORR	3	Safety
	RL-WT04	DST Corrosion Monitoring	Hanford	2	Safety
	SR99-2045	In-Situ Waste Tank Corrosion Probe	SRS	2	Safety
	RL-WT05	Remote Inspection of High-Level Waste Single-Shell Tanks	Hanford	3	Safety
	ID-2.1.20	Tank Annulus/Vault Inspection	INEEL	1	Safety
	RL-WT022	Tank Knuckle NDE	Hanford	3	Safety
	SR99-2035	Develop Advanced Techniques for Life Extension of High Level Waste Tanks and Piping	SRS	3	Safety
	OR-TK-01	Tank Waste Characterization	ORR	3	Safety
1.1.1.3	**Remediate Loss of Tank Integrity**				
1.1.2	**Ventilate Tanks**				
	ID-2.1.27	Blowback Metal Filters for Solids (Calcine) Retrieval	INEEL	1	Safety
	SR99-2027	Demonstrate Alternative Filtration Technologies to Replace HEPA Filters	SRS	3	Safety
1.1.3	**Characterize Waste**				
1.1.3.1	**Characterize Waste In Situ**				
1.1.3.2	**Sample Waste**				
	ID-2.1.26	Nested Array Fluidic Sampler for Tank Solution Characterization	INEEL	1	Characterization
	ID-2.1.44	Certify LDUA Sampler as EPA-Approved Method of Sampling Tank Heel Solids	INEEL	1	Characterization
	ID-2.1.43	Certify LDUA Sampler as EPA-Approved Method of Sampling Tank Heel Liquids	INEEL	1	Characterization
	RL-WT09	Representative Sampling and Associated Analysis to Support Operations and Disposal	Hanford	1	Characterization
1.1.3.3	**Analyze Waste**				
	ID-2.1.16	Decon Facility/Analytical Facility Waste Reduction	INEEL	1	Characterization
	RL-WT01	Technetium-99 Analysis in Hanford Tank Waste and Contaminated Tank Farm Areas	Hanford	2	Characterization
	RL-WT065	Direct Inorganic and Organic Analyses of High-Level Waste	Hanford	3	Characterization
	OR-TK-04	Sludge Mixing and Slurry Transport	ORR	1	Characterization
	SR99-2037	Tank Heel Removal/Closure Technology	SRS	1	Characterization
	SR99-2044	Demonstrate In-Situ Characterization Weight Percent Probe	SRS	2	Characterization
1.1.4	**Reduce Waste Volume**				
1.1.4.1	**Reduce Source Streams**				
1.1.4.2	**Reduce Recycle Streams**				
	ID-2.1.36	Mercury Removal from Liquid Wastes	INEEL	1	Pretreatment
	ID-2.1.56	Mercury Treatment for Aluminum Calcine	INEEL	1	Pretreatment

Table A.2. Continued

PE#	Problem Element Title		Site	PTC Priority	Function
1.2	**Process Waste**				
1.2.1	**Retrieve Waste**				
1.2.1.1	**Deploy Equipment**				
1.2.1.2	**Mobilize Bulk and Heel Wastes**				
	ID-2.1.50	Solids Waste (Calcine) Retrieval	INEEL	1	Retrieval
	SR99-2041	Demonstration of Alternative Mixer Technology for HLW Pump Tanks	SRS	3	Retrieval
	SR99-2037	Tank Heel Removal/Closure Technology	SRS	1	Retrieval
	SR99-2028	Alternative Waste Removal Technology	SRS	1	Retrieval
	RL-WT060	PHMC Retrieval and Closure - Hanford/ SRS Waste Mixing Mobilization	Hanford	2	Retrieval
	RL-WT062	PHMC DST Retrieval - Hanford DST Transfer Pump Improvements	Hanford	2	Retrieval
	RL-WT063	PHMC Retrieval and Closure - Hanford SST Saltcake Dissolution Retrieval	Hanford	2	Retrieval
	ID-2.1.47	Management of Tank Heel Solids	INEEL	1	Retrieval
	OH-WV-905	Retrieval of Tank Heels	WVDP	1	Retrieval
	OR-TK-02	Tank Solid Waste Retrieval	ORR	1	Retrieval
	RL-WT013	Establish Retrieval Performance Evaluation Criteria	Hanford	1	Retrieval
	RL-WT027	Tank Leak Mitigation Systems	Hanford	1	Retrieval
	RL-WT064	PHMC Retrieval and Closure - Hanford Past Practice Sluicing Improvements	Hanford	2	Retrieval
	SR99-2037	Tank Heel Removal/Closure Technology	SRS	1	Retrieval
	OR-TK-03	Sludge Mixing and Mobilization	ORR	3	Retrieval
	OR-TK-02	Tank Solid Waste Retrieval	ORR	1	Retrieval
	SR99-3022	In-situ Grouting and/or Retrieval of Waste from Underground Tanks	SRS	2	Retrieval
1.2.1.4	**Transfer Waste**				
1.2.1.5	**Detect and Mitigate Leaks**				
	OH-WV-907	Leak Mitigation for High-Level Waste Tanks	WVDP	1	Safety
	RL-WT026	Tank Leak Detection Systems for Underground Single-Shell Waste Storage Tanks (SSTs)	Hanford	1	Safety
	RL-WT027	Tank Leak Mitigation Systems	Hanford	1	Safety
	SR99-2039	Methods to Unplug Waste Transfer Lines	SRS	2	Retrieval
	SR99-2035	Develop Advanced Techniques for Life Extension of High Level Waste Tanks and Piping	SRS	3	Retrieval
	RL-WT023	Prediction of Solid Phase Formation in Static and Dynamic Hanford Tank Waste Solutions	Hanford	2	Retrieval
1.2.1.6	**Monitor & Control Retrieval Process**				
1.2.1.7	**Integrate Retrieval and Pretreatment Technology Systems**				
1.2.1.8	**Mobilize Heel**				
1.2.2	**Pretreat Waste**				
1.2.2.1	**Calcine Waste**				
1.2.2.2	**Dissolve Waste**				
	ID-2.1.51	Develop Calcine Dissolution Kinetics for Solid/Liquid Equilibria	INEEL	1	Pretreatment

Table A.2. Continued

PE#	Problem Element Title		Site	PTC Priority	Function
1.2.2.3	**Prepare Retrieved Waste for Transfer and Pretreatment**				
	SR99-2039	Methods to Unplug Waste Transfer Lines	SRS	2	Pretreatment
	RL-WT023	Prediction of Solid Phase Formation in Static and Dynamic Hanford Tank Waste Solutions	Hanford	2	Pretreatment
	OR-TK-02	Tank Solid Waste Retrieval	ORR	1	Pretreatment
	RL-WT063	PHMC Retrieval and Closure - Hanford SST Saltcake Dissolution Retrieval	Hanford	2	Pretreatment
1.2.2.4	**Clarify Liquid Stream**				
	OR-TK-05	Tank Sludge and Supernatant Separations	ORR	1	Pretreatment
	OR-TK-04	Sludge Mixing and Slurry Transport	ORR	1	Pretreatment
1.2.2.5	**Remove Radionuclides**				
	ID-2.1.55	Sr Removal from High Activity Wastes	INEEL	1	Pretreatment
	ID-2.1.54	TRU Removal from High Activity Wastes	INEEL	1	Pretreatment
	ID-2.1.06	TRU, Cs and Sr Removal from High Activity Wastes	INEEL	1	Pretreatment
	ID-2.1.53	Cs Removal from High Activity Wastes	INEEL	1	Pretreatment
	ID-2.1.63	Universal Solvent Process for TRU, Cs and Sr Removal	INEEL	1	Pretreatment
	SR99-2034	Second Generation Salt Feed Preparation	SRS	1	Pretreatment
	SR99-1011	Demonstrate Evaporation Technologies to Reduce Generation of Secondary Waste Volume from Consolidated Incineration Facility	SRS	2	Pretreatment
	OR-TK-11	Tank Supernatant Pretreatment	ORR	1	Pretreatment
1.2.2.6	**Integrate Pretreatment and LLW Immobilization Technology Systems**				
	ID-2.1.24	Integration/Optimization of High Activity Waste Low Activity Waste Process Flowsheet	INEEL	1	Immobilization
	ID-2.1.30	Remove/Treat Chlorides (LET&D/PEWE/ Future Idaho Processes)	INEEL	1	Pretreatment
	ID-2.1.29	Evaluate Chloride Corrosion Potential (LET&D/PEWE/Future Processes)	INEEL	1	Pretreatment
1.2.2.7	**Process Sludge**				
	RL-WT024	Enhanced Sludge Washing Process Data	Hanford	3	Pretreatment
	RL-WT023	Prediction of Solid Phase Formation in Static and Dynamic Hanford Tank Waste Solutions	Hanford	2	Characterization
	RL-WT024	Enhanced Sludge Washing Process Data	Hanford	3	Characterization
1.2.2.8	**Prepare Pretreated Waste for Immobilization**				
	ID-2.1.38	Conditioning of Low Activity Waste for Treatment	INEEL	1	Immobilization
	ID-2.1.40	Low Activity Waste Grout Sorbent Addition to Reduce Leachability	INEEL	1	Immobilization
	ID-2.1.35	Direct Immobilization of INTEC Sodium-Bearing Waste	INEEL	1	Immobilization
	ID-2.1.23	Low-Activity Waste Form Qualification	INEEL	1	Immobilization
	ID-2.1.28	Cs Removal from Newly Generated Liquid Waste	INEEL	1	Immobilization
	OR-TK-06	Tank Sludge Supernatant Immobilization	ORR	1	Immobilization
1.2.2.9	**Monitor & Control Pretreatment Process**				
1.2.3	**Immobilize Waste**				
1.2.3.1	**Process LLW**				
1.2.3.1.1	**Monitor & Control LLW Immobilization Process**				
1.2.3.1.2	**Prepare LLW Feed**				
1.2.3.1.3	**Immobilize LLW Stream**				

Table A.2. Continued

PE#	Problem Element Title		Site	PTC Priority	Function
1.2.3.1.4	**Treat LLW Offgas**				
1.2.3.1.5	**Dispose of LLW**				
1.2.3.2	**Process HLW**				
	ID-2.1.18	Continuous Emissions Monitor for Offgas Analysis	INEEL	1	Characterization
	ID-2.1.58	HAW Immobilization	INEEL	1	Immobilization
	SR99-2036	Develop Second Generation DWPF Melter	SRS	3	Immobilization
	ID-2.1.57	Conditioning of HAW for Treatment	INEEL	1	Immobilization
	RL-WT06	Identification and Management of Problem Constituents for HLW Vitrification	Hanford	1	Immobilization
	SR99-2032	Optimize Melter Glass Chemistry	SRS	2	Immobilization
	ID-2.1.58	HAW Immobilization	INEEL	1	Immobilization
1.2.3.2.1	**Monitor & Control HLW Immobilization Process**				
1.2.3.2.2	**Prepare Secondary Waste from Pretreatment**				
1.2.3.2.3	**Prepare Sludge Feed**				
1.2.3.2.4	**Immobilize HLW Stream**				
1.2.3.2.5	**Treat HLW Offgas**				
1.3	**Store Waste Forms and Close Tanks**				
1.3.1	**Close Tanks**				
	ID-2.1.47	Management of Tank Heel Solids	INEEL	1	Closure
	ID-2.1.46	Management of Tank Heel Liquids	INEEL	1	Closure
	ID-2.1.42	Acceptance Criteria for Tank Closure	INEEL	1	Closure
	ID-2.1.39	Acceptance Criteria for LAW Disposal in Underground Storage Tanks	INEEL	1	Closure
	ID-2.1.48	Waste Form Qualification for Low-Activity Waste in Underground Storage Tanks	INEEL	1	Closure
	ID-2.1.45	Acceptance Criteria for Grouting Tank Heels	INEEL	1	Closure
	RL-WT013	Establish Retrieval Performance Evaluation Criteria	Hanford	1	Closure
	SR99-2051	Technology to Mitigate Effects of Technetium Under Tank Closure Conditions	SRS	1	Closure
	RL-WT061	Reactive Barriers to Contaminant Migration	Hanford	3	Closure
	OR-TK-09	Tank Closure	ORR	3	Closure
	OH-WV-904	High Level Waste Tank Closure	WVDP	1	Closure
	SR99-3022	In-situ Grouting and/or Retrieval of Waste from Underground Tanks	SRS	2	Closure
	SR99-2051	Technology to Mitigate Effects of Technetium Under Tank Closure Conditions	SRS	1	Pretreatment
1.3.1.1	**Monitor Tank**				
1.3.1.2	**Characterize Heels**				
1.3.1.3	**Define Closure Criteria**				
1.3.1.4	**Treat Supernate in Place**				
1.3.1.5	**Treat Heel in Place**				
1.3.1.6	**Detect Leaks**				
1.3.1.7	**Stabilize Tank for Closure**				
1.3.1.8	**Monitor Site**				

Table A.2. Continued

PE#	Problem Element Title		Site	PTC Priority	Function
1.3.2	**Dispose of LLW**				
	RL-WT066	Compositional Dependence of the Long Term Performance of Glass as a Low-Activity Waste Form	Hanford	2	Immobilization
	RL-WT015	Standard Method for Determining Waste Form Release Rate	Hanford	2	Immobilization
	RL-WT016	Glass Monolith Surface Area	Hanford	2	Immobilization
	RL-WT018	Testing of Sand-Gravel Capillary Barrier	Hanford	3	Closure
	RL-WT017	Long-Term Testing of Surface Barrier	Hanford	3	Closure
	RL-WT029	Data and Tools for Performance Assessments	Hanford	2	Closure
1.3.2.1	**Monitor Low Level Waste for Acceptance**				
1.3.2.2	**Determine Performance of Waste Form**				
1.3.2.3	**Provide Disposal System**				
1.3.3	**Store and Dispose HLW**				
1.3.3.1	**Provide Interim Storage HLW**				
1.3.3.2	**Provide Shipping Facilities**				
1.3.3.3	**Monitor High Level Waste for Acceptance**				
1.4	**Decontamination and Decommissioning**				
	ID-2.1.16	Decon Facility/Analytical Facility Waste Reduction	INEEL	1	Pretreatment
	ID-2.1.17	Develop New Filter Leach Process	INEEL	1	Pretreatment
	OR-TK-02	Tank Solid Waste Retrieval	ORR	1	Retrieval
	SR99-2040	Demonstrate Remote Decommissioning and Disassembly of High Level Waste Processing Equipment	SRS	3	Retrieval
	RL-WT021	Cleaning, Decontaminating and Upgrading Hanford Pits	Hanford	2	Retrieval
	SR99-2037	Tank Heel Removal/Closure Technology	SRS	1	Retrieval
	SR99-2029	Alternative DWPF Canister Decon Technology	SRS	3	Immobilization
	OH-WV-908	Decontamination of High-Level Waste Contaminated Equipment	WVDP	1	Immobilization
	SR99-2031	Develop Remote Technology to Improve DWPF Operations	SRS	3	Immobilization
	OH-WV-903	Vitrification Expended Material Processing	WVDP	1	Immobilization
	SR99-2040	Demonstrate Remote Decommissioning and Disassembly of High Level Waste Processing Equipment	SRS	3	Immobilization

Table A.3. Tanks Focus Area FY 2000 - FY 2001 Integrated Priority Listing

TFA Pri	TFA Resp	Technical Response Title	Benefiting Sites					Site Needs Included
			Han	INEEL	ORR	SRS	WVDP	
1	99068	Improve Performance and Design of HLW Melters		■		■		ID-2.1.57, ID-2.1.58, SR99-2036
2	99054A	Prevention of Solids Formation	■		▒	▒		OR-TK-02, RL-WT023, SR99-2039
3	99043	High Level Waste Tank Corrosion Control and Monitoring	■		▒	■		OR-TK-01, RL-WT04, SR99-2045
4	99067	Tank Heel Retrieval Technology	▒		■	■	■	ID-2.1.47, OH-WV-905, OR-TK-02, RL-WT013, RL-WT027, RL-WT064, SR99-2037
5	99073	Improve Waste Loading and HLW Glass	■	■		■		ID-2.1.58, RL-WT06, SR99-2032
6	99077	Demonstrate Remote Disassembly of HLW Melters and Other Processing Equipment				■	■	OH-WV-903, SR99-2040
7	99086	Evaporation/Cesium Removal at ORNL			■			OR-TK-11, SR99-1011
8	99019	Conditioning and Immobilization of Low-Activity Waste to Meet Waste Acceptance Criteria		■	▒			ID-2.1.23, ID-2.1.28, ID-2.1.35, ID-2.1.38, ID-2.1.40, OR-TK-06
9	99023	Idaho Tank WM-182 Closure Demonstration		■				ID-2.1.39, ID-2.1.42, ID-2.1.45, ID-2.1.46, ID-2.1.47, ID-2.1.48, ID-2.1.62
10	99085	Demonstration of Grout Injection Technology for Tank Closure			■	■	▒	OH-WV-904, OR-TK-09, SR99-3022
11	99003	Decontamination Methods Development		■				ID-2.1.16, ID-2.1.17
12	99070	Salt Cesium Separation Processes				■		SR99-2034
13	99082	Horizontal and Small Tank Sludge Mixing and Mobilization			■	■		OR-TK-02, OR-TK-03, SR99-3022
14	99057	Tank Leak Detection, Monitoring, and Mitigation	■				■	OH-WV-907, RL-WT026, RL-WT027
15	99054B	Saltcake Dissolution	■					RL-WT023, RL-WT063
16	99075	Tank Inspection and Integrity Techniques for Hanford, SRS, ORR, and INEEL	■	■	■	■		ID-2.1.20, ID-TK-01, RL-WT05, RL-WT022, SR99-2035
17	99076	Waste Transfer Line Plugging Prevention and Unplugging Methods	▒		▒	■		RL-WT023, SR99-2035, SR99-2039
18	99001	TRU, Sr and Cs Removal from INEEL Wastes		■				ID-2.1.06, ID-2.1.53, ID-2.1.54, ID-2.1.55
19	99084	Solid-Liquid Separations—MVST			■			OR-TK-04, OR-TK-05
20	99048	Testing and Prediction of Long Term Waste Glass Performance	■					RL-WT015, RL-WT066
21	99009	Integration/Optimization of High Activity Waste/Low Activity Waste Process Flowsheet		■				ID-2.1.24
22	99052	Technologies for Pit Operation Enhancement, Remote Operations/Maintenance, and Disassembly	■		■	■	■	OR-TK-02, RL-WT021, SR99-2037, SR99-2040, OH-WV-908
23	99059	Hanford/SRS Waste Mixing and Mobilization	■			■		RL-WT060, RL-WT062, SR99-2028, SR99-2037, SR99-2041
24	99078	In-Tank Wt% Suspended Solids Probe and Slurry Monitors			▒	■		OR-TK-04, SR99-2037, SR99-2044

■	= Primary Benefit
▒	= Secondary Benefit
	= No benefit or benefit undetermined

Table A.3. Continued

TFA Pri	TFA Resp	Technical Response Title	Benefiting Sites					Site Needs Included
			Han	INEEL	ORR	SRS	WVDP	
25	99088B	Leaching and Treatment of Tc for Tank Closure						SR99-2051
26	99018	Removal of Mercury from NWCF Scrub Solutions						ID-2.1.36, ID-2.1.56
27	99046	Nested Array Fluidic and LDUA Sampler for Tank Waste						ID-2.1.26, ID-2.1.43, ID-2.1.44, RL-WT09
28	99005	Continuous Emissions Monitor for Off-gas Analysis						ID-2.1.18
29	99032	Develop Calcine Dissolution Kinetics for Solid/Liquid Equilibria						ID-2.1.51
30	99031	Dry Solid Wastes Retrieval						ID-2.1.50
31	99071	Alternative Filtration Technologies						ID-2.1.27, SR99-2027
32	99072	Alternative DWPF Canister Decontamination Techniques						OH-WV-902, SR99-2029
33	99049	Glass Monolith Surface Area						RL-WT016
34	99050	Surface Barrier Testing						RL-WT017, RL-WT018
35	99014	Remove/Treat Chlorides (LET&D/PEWE/Future Processes)						ID-2.1.29, ID-2.1.30
36	99060	Sequestering of Radionuclide Contaminant Migration						RL-WT061, SR99-2051
37	99064	Validate Analytical Procedures for Radioactive Waste Samples						ID-2.1.16, RL-WT01, RL-WT065
38	99055A	Sludge Processing Parametric Studies						RL-WT024
39	99101	Tank Closure Strategy						ID-2.1.42, ID-2.1.46, ID-2.1.47, OR-TK-09, RL-WT013
40	99098	Alkaline Solvent Extraction						ID-2.1.53, ID-2.1.63, SR99-2034
41	99100	Validate Analytical Technologies						ID-2.1.16, RL-WT065
42	99062	Salt Cake Dissolution Retrieval						RL-WT063
43	99058	Data and Tools for Performance Assessment						RL-WT029
44	99102	Barriers for Tanks/Tank Farms Closure						RL-WT017, RL-WT018, RL-WT061
45	99099	INEEL Calcine Direct Immobilization						ID-2.1.58
46	99041	Universal Solvent Process for TRU, Sr and Cs Removal						ID-2.1.63
47	99074	Develop Remote Technology to Improve DWPF Operations						SR99-2031
48	99055B	HLW Sludge Washing Monitor						RL-WT023, RL-WT024
49	99103	Privatization Roadmap						RL-WT024, RL-WT027, RL-WT064
50	99047A	Vadose Zone Characterization Technologies						RL-WT013

	= Primary Benefit
	= Secondary Benefit
	= No benefit or benefit undetermined

Site: Hanford

Site Need ID: RL-WT01
Site Need Title: Technetium-99 Analysis in Hanford Tank Waste and Contaminated Tank Farm Areas
Need Summary: An accurate, robust production laboratory method for the measurement of technetium-99 (Tc-99) concentration in Hanford low-level waste tank matrices and in vadose zone soils surrounding the tanks is needed. The method must provide a high level of confidence in the Tc-99 concentrations because this data is important for risk-based assessments. Technetium-99 concentration is also a critical component of feed to the waste vitrification vendors. The absolute accuracy of these analytical results produced at Hanford has been questioned and found to be in disagreement with results produced at another DOE site. To obtain a high level of confidence, verification of method performance needs to be done by the use of independent methods and/or by interlaboratory comparisons on actual waste samples between DOE Sites.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99064, Validate Analytical Procedures for Radioactive Waste Samples, TFA priority #37.

Site Need ID: RL-WT04
Site Need Title: DST Corrosion Monitoring
Need Summary: Corrosion monitoring of DSTs is currently provided by process knowledge and tank sampling. Tanks found to be within chemistry specification limits are considered to be not at risk for excessive corrosion damage. There have been no direct corrosion monitoring systems for DSTs in use at the Hanford Site. As many as 6 low hydroxide (out of corrosion specification) tanks continue to be operated. This indicates that this system is inadequate to support corrosion control. Tank samples are infrequent and their analysis difficult and expensive. Process knowledge is complicated by waste streams that are exempt from the corrosion control specifications. In-tank, real-time measurement of the corrosive characteristics of the tank wastes is needed to improve control of corrosion processes.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99043, High Level Waste Tank Corrosion Control and Monitoring, TFA priority #3.

Site Need ID: RL-WT05
Site Need Title: Remote Inspection of High-Level Waste Single-Shell Tanks
Need Summary: The Tri-Party Agreement (TPA) schedule requires retrieval of wastes in the SSTs to begin by 2004 for future vitrification and permanent storage in a waste repository. In order to meet this schedule, a retrieval method needs to be selected to retrieve the waste for processing. A non-destructive examination of the tank needs to be performed prior to the selection of a retrieval method to assure successful retrieval of the waste from the tank.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99075, Tank Inspection and Integrity Techniques for Hanford, SRS, ORR, and INEEL, TFA priority #16.

Site Need ID: RL-WT06
Site Need Title: Identification and Management of Problem Constituents for HLW Vitrification
Need Summary: Currently, HLW glasses are formulated to assure that little or no insoluble phases exist in the HLW melter. Insoluble phases are caused by such problem constituents as chrome minerals, spinels, and noble metals. An alternative method for handling problem constituents in HLW glasses is needed.

Information is needed on the technical viability of producing HLW glasses with insoluble phases. Information such as settling rates and rheological properties is needed for insoluble phases to determine if the phases will settle in a HLW melter and, if so, whether the settled sludge can be discharged through a bottom drain or by other means. Information is also needed to determine the impact of the insoluble phases on the durability of the waste form.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99073, Improve Waste Loading and HLW Glass, TFA priority #5.

Site Need ID: RL-WT09
Site Need Title: Representative Sampling and Associated Analysis to Support Operations and Disposal
Need Summary: A representative, and preferably rapid, sampling and analysis system needs to be developed and demonstrated so that feeds to the cross-site transfer line and to both the LLW and HLW privatization contractors can be staged successfully with a minimum impact on tank space. Current grab samplers consisting of "bottle-on-a-string" are used for slurry/supernate sampling.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99046, Nested Array Fluidic and LDUA Sampler for Tank Waste, TFA priority #27.

Site Need ID: RL-WT013
Site Need Title: Establish Retrieval Performance Evaluation Criteria
Need Summary: Several discrete technology needs must be satisfied to support decisions for tank closure alternatives. These needs include improvements to equipment and methods for tank waste heel removal, methods to capture samples of waste that are not directly below the riser, and methods to map contaminants in the vadose zone. These needs include:

- Vadose Zone Contaminants Distribution
- SST Retrieval Equipment/System Development
- Sampling Methods For Residual Heels - Off Riser Axis

Technical Disposition: The TFA responded to this need within the following technical responses:

- 99101, Tank Closure Strategy, TFA priority #39.
- 99067, Tank Heel Retrieval Technology, TFA priority #4.

- 99047A, Vadose Zone Characterization Technologies, TFA priority #50.

Site Need ID: RL-WT015
Site Need Title: Standard Method for Determining Waste Form Release Rate
Need Summary: Develop a standard waste form release rate test method that is relevant to expected performance in the disposal environment and for use as an ILAW product specification. The test should be accepted by a standards test organization such as the ASTM. The test method must provide usable results within a 90-day time period such that the compliance of the waste form to the product specifications can be confirmed and payment to the private contractor authorized. The test method will be implemented in a production environment.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99048, Testing and Prediction of Long Term Waste Glass Performance, TFA priority #20.

Site Need ID: RL-WT016
Site Need Title: Glass Monolith Surface Area
Need Summary: A method is needed to estimate the surface area of vitrified low activity waste. The contaminant release rate from glasses is proportional to the surface area reachable by moving moisture. As glass cools it experiences internal stresses and strains which may cause the glass to crack and hence increase the surface area on the glass. External stresses (for example, those caused by earthquakes) could also increase surface area.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99049, Glass Monolith Surface Area, TFA priority #33.

Site Need ID: RL-WT017
Site Need Title: Long-Term Testing of Surface Barrier
Need Summary: Surface barriers are being used over many Hanford environmental restoration and waste management sites and more barriers are expected in the future. Such barriers are used to reduce moisture infiltration and plant and animal intrusion. Short-term testing of barriers has occurred under project-sponsored activities, but long-term studies have not been funded. Project-specific funding at Hanford ended September 1997. Since the design life of the surface barrier is 1,000 years, degradation data is needed to better understand the validity of the design life estimate. A similar Technology Needs statement has also been included in the Subcon needs list. Short-term testing has been performed, but longer-term continuous testing is needed.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99102, Barriers for Tanks/Tank Farms Closure, TFA priority #44.
- 99050, Surface Barrier Testing, TFA priority #34.

Site Need ID: RL-WT018
Site Need Title: Testing of Sand-Gravel Capillary Barrier

Need Summary: Water is the driving force behind releasing contaminants from waste forms and then carrying those contaminants to groundwater. Unlike a surface, the capillary barrier diverts water away from the object underneath, rather than storing the water until evaporation or plant transpiration removes the water. Thus, the capillary barrier is expected to have a significantly longer life and be more effective than a surface barrier for moisture diversion. Although the principles of sand-gravel capillary barriers are well established, such barriers (especially of ones the size needed for DOE applications) have not been extensively tested. Performance data are needed to confirm design parameters and long-term performance estimates.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99050, Surface Barrier Testing, TFA priority #34.
- 99102, Barriers for Tanks/Tank Farms Closure, TFA priority #44.

Site Need ID: RL-WT021
Site Need Title: Cleaning, Decontaminating and Upgrading Hanford Pits
Need Summary: Waste retrieved from Hanford tanks must pass through a number of pits associated with SSTs before the privatization contractor for disposal receives it. Many of these pits will have to be modified before the waste can be transferred. Current methods for modifying, operating, cleaning and decontaminating these pits are labor intensive, costly, and result in a high dose to workers. Technologies for remote mapping or remote handling must be adapted to the configuration and specific tasks that are required. Existing commercial equipment cannot be deployed without modification. Chemical methods to decontaminate surfaces must be demonstrated to be effective, then methods must be developed to assure cleaning solutions can be contained during decontamination, and suitably disposed after the solution is loaded with contaminants.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99052, Technologies for Pit Operation Enhancement, Remote Operations/Maintenance, and Disassembly, TFA priority #22.

Site Need ID: RL-WT022
Site Need Title: Tank Knuckle NDE
Need Summary: The Tri-Party Agreement (TPA) schedule requires the completion of the DST system Integrity Assessment Program by the end of fiscal year 1999. It is required that no fewer than 6 DSTs will undergo a non-destructive examination of a portion of the tank wall, bottom knuckle, and bottom. NDE equipment must be deployed to fulfill this requirement.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99075, Tank Inspection and Integrity Techniques for Hanford, SRS, ORR, and INEEL, TFA priority #16.

Site Need ID: RL-WT023
Site Need Title: Prediction of Solid Phase Formation in Static and Dynamic Hanford Tank Waste Solutions

Need Summary: Information is needed on the physical and chemical properties of the Hanford tank wastes, which represent the complex solid and liquid matrices, and on the dynamics of solid phase formation during Hanford tank waste transfers. This information is needed to predict, prevent, or recover from solids precipitation, gel formation, and the crystal structure of solids, which form in retrieval, wash, and leach solutions. Much information is available from past solubility chemistry work at Hanford and from other DOE sites.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99054A, Prevention of Solids Formation, TFA priority #2.
- 99054B, Saltcake Dissolution, TFA priority #15.
- 99076, Waste Transfer Line Plugging Prevention and Unplugging Methods, TFA priority #17.
- 99055B, HLW Sludge Washing Monitor, TFA priority #48.

Site Need ID: RL-WT024
Site Need Title: Enhanced Sludge Washing Process Data
Need Summary: This is a continuation of the Enhanced Sludge Wash (ESW) program that has been in progress for several years. A strategy was originally developed (Kupfer 1994, Kupfer 1995) that showed how data from 47 SSTs could be used to represent 93 % of the SST sludge volume. During fiscal years 1994, 1995, 1996, and 1997 enhanced sludge washing tests were performed on 30 samples of SST sludges to establish chemical and radionuclide removal efficiencies. When ESW showed poor chromium removal from particular sludge samples, additional tests were performed to determine how to improve the chromium removal by longer leach times or by oxidative leaching. The results from these tests were extrapolated to represent 75 % of the SST sludge volume at Hanford.

The scope of additional testing is similar to the program that was planned for FY 1998. This includes testing the effect of temperature, duration and caustic concentration on the leach/wash behavior of high priority sludges, and observing the stability of leachates and wash solutions. Tank waste sludge samples showing poor chromium removal need to be subjected to additional testing to determine how to increase chromium removal.

The final aspect of ESW work is the cross-checking of ESP results with experimental results. Four ESW experiments were modeled during the current year and six more are scheduled for FY 1999.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99103, Privatization Roadmap, TFA priority #49.
- 99055A, Sludge Processing Parametric Studies, TFA priority #38.
- 99055B, HLW Sludge Washing Monitor, TFA priority #48.

Site Need ID: RL-WT026
Site Need Title: Tank Leak Detection Systems for Underground Single-Shell Waste Storage Tanks (SSTs)
Need Summary: The use of past-practice sluicing for SST waste removal involves the addition of liquid to tanks, which increases the potential for waste leakage to the

environment. Leak detection applies to all SST retrieval, including retrieval during Phase I and preparation of the Phase II specification. Leak detection methods are needed that can signal and quantify a leak from a tank when only a small amount of waste has escaped.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99057, Tank Leak Detection, Monitoring, and Mitigation, TFA priority #14.

Site Need ID: RL-WT027
Site Need Title: Tank Leak Mitigation Systems
Need Summary: Mitigating systems that improve on the capabilities of the current baseline approach are needed. The objective is to prevent, curb, or eliminate the possibility or extent of liquid waste leakage from underground storage tanks into the surrounding soils. If cost-benefit, risk-reduction, and alternatives evaluations of new mitigating technologies determine that deployment, implementation, and operation is feasible, then further evaluation should be pursued. Such evaluations may include demonstrations and testing. Example concepts that could be evaluated include retrieval methods which minimize the potential for leakage, leak point and potential leak point location, "seek-and-seal" devices and methods, administrative approaches that maximize the use and coordination of currently available tools and methods, sheet barriers, close-coupled grout injection barriers, and dry-air containment barriers.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99057, Tank Leak Detection, Monitoring, and Mitigation, TFA priority #14.
- 99067, Tank Heel Retrieval Technology, TFA priority #4.
- 99103, Privatization Roadmap, TFA priority #49.

Site Need ID: RL-WT029
Site Need Title: Data and Tools for Performance Assessments
Need Summary: Performance assessments must be developed for all disposal actions, and the models that are used for these assessments require a defensible basis for the movement of water. Most databases describe recharge and distribution of water for non-arid conditions. The arid conditions at Hanford are not accurately represented by the existing data. This need is comprised of two elements:

(1) Recharge water is the primary means for dissolution and release of contaminants from the buried waste and transport of those contaminants to the groundwater. Estimation of these rates is difficult under arid conditions because the rates are very low, and (2) assessments of waste disposal require the knowledge of hydraulic properties in the unsaturated sediments (the vadose zone). Typically, these properties are inferred or estimated from small cores or particle size distributions obtained from a drilled borehole. This Technology Needs statement has been included in the Subcon needs list.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99058, Data and Tools for Performance Assessment, TFA priority #43.

Site Need ID: RL-WT060
Site Need Title: PHMC Retrieval and Closure - Hanford/SRS Waste Mixing Mobilization

Need Summary: This activity combines mixer pump retrieval enhancement needs from Hanford and SRS. Hanford needs enhanced sludge mobilization methods to retrieve sludge that is beyond the Effective Cleaning Radius (ECR) of the baseline pair of long-shaft mixer pumps. Hanford also requires, as part of mixer pump retrieval, a means of transferring waste from a tank that is being actively mixed at the best waste depth for a given transfer requirement with attendant low water level conditions. This must be accomplished without having to change pumps for surface decant and bottom/sludge transfer. Both Hanford and SRS are also interested in identifying replacements for baseline mixer pumps with more cost-effective alternates with respect to life-cycle/ operations costs for bulk sludge, sludge heel, and salt cake retrieval both in large HLW storage tanks and in smaller process tanks such as SRS transfer system Pump Tanks. Safety impacts to Authorization Bases also need to be evaluated. The TFA is evaluating the use of Flygt mixers for SRS this year as part of this goal. SRS is preparing to begin sludge retrieval using its baseline long-shaft mixers. They need to optimize their operational strategy so that as much sludge as possible can be sent to DWPF as feed. This will require testing of multiple pump retrieval interactions. Hanford may use results of the SRS work for long-shaft mixer operational improvements as a candidate solution for the extended sludge retrieval.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99059, Hanford/SRS Waste Mixing and Mobilization, TFA priority #23.

Site Need ID: RL-WT061
Site Need Title: Reactive Barriers to Contaminant Migration
Need Summary: Sixty-seven of the 149 SSTs at Hanford are known or suspected to have leaked. Retrieval of waste from these tanks will incur risk from additional leakage. Waste that has been retrieved will be processed, vitrified and disposed in solid form. Based on past analyses, retrieved waste may add radionuclides to the soil column. If these key radioactive elements could be trapped or immobilized in the waste matrix, disposal facility, and/or the soil column, the risk to human health and the environment could be significantly reduced. It is proposed that sequestering agents be deployed as a permeable flow-through (reactive) barrier to attenuate the migration of these contaminants and reduce the risk. Although limited efforts have been performed to identify "getter" materials (sequestering agents), to date no material has been sufficiently tested to be selected.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99060, Sequestering of Radionuclide Contaminant Migration, TFA priority #36.
- 99102, Barriers for Tanks/Tank Farms Closure, TFA priority #44.

Site Need ID: RL-WT062
Site Need Title: PHMC DST Retrieval - Hanford DST Transfer Pump Improvements
Need Summary: Capability to transfer supernate, sludge, slurries out of a DST while the mixer pumps are operating at full speed is needed to support waste feed delivery to the privatization contractor. It is desired to accomplish this with the minimum amount of equipment located in the DST. An improved pump concept or configuration must be demonstrated that can withstand the jet forces from the mixer pumps and, when required, pump only the supernate. Current baseline does not allow for simulanteous operations of the

transfer pump while the mixer pumps are operating. The time delay between shutting down the mixers and starting the transfer may be too great to transfer sufficient HLW solids to the privatization contractor without delays.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99059, Hanford/SRS Waste Mixing and Mobilization, TFA priority #23.

Site Need ID: RL-WT063
Site Need Title: PHMC Retrieval and Closure - Hanford SST Saltcake Dissolution Retrieval
Need Summary: Performance data and retrieval efficiency data is required for a simplified sprinkler-applied water dissolution system for saltcalke in Hanford's SSTs. Effects of in-tank hardware and tank walls shall also be determined. This system is also known as the Low Volume Density Gradient (LVDG) retrieval method. Application of this method to a representative simulant of waste shall provide the necessary data to select this method for baseline implementation.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99062, Salt Cake Dissolution Retrieval, TFA priority #42.
- 99054B, Saltcake Dissolution, TFA priority #15.

Site Need ID: RL-WT064
Site Need Title: PHMC Retrieval and Closure - Hanford Past Practice Sluicing Improvements
Need Summary: Improvements in sluicing technology have been made since past practice sluicing was performed at Hanford for tank waste retrieval. A better understanding of these improvements and how they compare to past practice sluicing is needed to optimize waste retrieval operations. A direct comparison between the past practice sluice nozzles and current industrial nozzle capabilities needs to be performed to provide the most effective design requirements to support HLW feed delivery. A comparison between past practice pumping systems and current improved pumping systems capabilities should also be completed. The comparisons must provide a clear quantitative analysis of the ability of each nozzle and pump type and configuration and its ability to move different waste types.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99103, Privatization Roadmap, TFA priority #49.
- 99067, Tank Heel Retrieval Technology, TFA priority #4.

Site Need ID: RL-WT065
Site Need Title: Direct Inorganic and Organic Analyses of High-Level Waste
Need Summary: Characterization is needed to ensure regulatorily-compliant treatment, storage, and disposal of the waste, including requirements for meeting land disposal restrictions, delisting, and permitting of the treatment facility. Characterization in support of regulatory compliance will be applied during a number of steps in the treatment cycle, including waste storage, feed delivery certification, treatment, waste products qualification and disposal. Methods for analysis of regulated constituents of concern have not been validated for high level radioactive waste matrices. A direct chemical analysis of tank waste

regulated inorganic and organic constituents would reduce turn-around time, waste production, and worker exposure.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99064, Validate Analytical Procedures for Radioactive Waste Samples, TFA priority #37.
- 99100, Validate Analytical Technologies, TFA priority #41.

Site Need ID: RL-WT066
Site Need Title: Compositional Dependence of the Long Term Performance of Glass as a Low-Activity Waste Form
Need Summary: Because of the relatively large amount of contaminants in the Immobilized Low-Activity Waste (ILAW) form, the rate of release must be slow as well as the rate limited for hundreds of thousands of years. Estimating such a long-term release rate from short-term experiments (even those lasting many years) requires a strong database, an understanding of the degradation process, and numerical simulation tools that combine the database and a mathematical model of the glass corrosion process. In particular, the database must be expanded so the affect of different glass compositions on long-term performance can be determined. An important subset of this need is to understand how glass composition impacts the rate of sodium ion-exchange in LAW glasses, which has been found to significantly affect the calculated pH in the disposal system and thus the long-term radionuclide release rate.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99048, Testing and Prediction of Long Term Waste Glass Performance, TFA priority #20.

Site: INEEL

Site Need ID: ID-2.1.06
Site Need Title: TRU, Cs and Sr Removal from High Activity Wastes
Need Summary: The removal of radioactive actinides (Cs and Sr) from liquid high activity wastes (HAW) is required to accomplish waste treatment strategies. This activity supplies waste stream feeds for vitrification and grouting programs. The removal of radionuclides from HAW will be accomplished in an integrated test involving three separate unit operations. This activity supports the HLW program at the INEEL, which is tasked with the management and treatment of HLW at the INEEL.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99001, TRU, Sr and Cs Removal from INEEL Wastes, TFA priority #18.

Site Need ID: ID-2.1.15
Site Need Title: Neutralization of Newly Generated Liquid Wastes
Need Summary: Newly-generated liquid waste (NGLW) has traditionally been combined with existing sodium-bearing wastes stored in the tank farm. This situation is not fully compliant with modern environmental regulations requiring double containment of wastes.

Based on the current operating assumptions, all of the sodium-bearing waste cannot be calcined by the end of 2012, as required by the Idaho Settlement Agreement. Aggressive reductions in the waste generation rates and/or segregation of newly-generated liquid wastes will be required to meet the 2012 requirement.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99002, Neutralization of Newly Generated Liquid Wastes. This technical response states the TFA is screening out the need at this time. The site is revising the need. Grouting work was moved to INEEL need ID-2.1.35 and is being addressed within TFA technical response 99019.

Site Need ID: ID-2.1.16
Site Need Title: Decon Facility/Analytical Facility Waste Reduction
Need Summary: The overall scope of this need is the reduction of waste (radioactive and mixed) from decontamination activities, the optimization of analytical processes and techniques, and the development/implementation of alternative waste stream treatments.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99100, Validate Analytical Technologies, TFA priority #41.
- 99064, Validate Analytical Procedures for Radioactive Waste Samples, TFA priority #37.
- 99003, Decontamination Methods Development, TFA priority #11.

Site Need ID: ID-2.1.17
Site Need Title: Develop New Filter Leach Process
Need Summary: The HEPA filter leach system generates hazardous radioactive liquid waste that is stored in INEEL's tank farm. Based on the current operating assumptions, all of the tank farm waste cannot be calcined by the end of 2012, as required by the Idaho Settlement Agreement. Aggressive reductions in waste generation rates will be required to meet the 2012 Settlement Agreement requirement. The current process, which leaches the used mixed waste HEPA filters with nitric acid to remove the RCRA components, produces one of the larger waste streams still being sent to the tank farm.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99003, Decontamination Methods Development, TFA priority #11.

Site Need ID: ID-2.1.18
Site Need Title: Continuous Emissions Monitor for Offgas Analysis
Need Summary: Offgas monitoring development is required for permitting and operation of existing and future Idaho Nuclear Technology and Engineering Center (INTEC) high-level waste treatment processes; namely, the New Waste Calcining Facility (NWCF), the High-Level Liquid Waste Evaporators (HLLWE), the Process Equipment Waste (PEW) evaporator, the Liquid Effluent Treatment & Disposal (LET&D) acid fractionator, future waste denitration, and waste melter processes. Continuous emissions monitoring will be required by the State and EPA in accordance with the Maximum Achievable Control Technology (MACT) rule for incinerators, the Clean Air Act (CAA) and the Resource

Conservation and Recovery Act (RCRA). Discrete offgas monitoring will be required to establish an emission inventory for INTEC processes during EPA trial burns. The monitor will also be required for process control feedback as required by MACT. To this end, a versatile, multi-component monitor consisting of an array of individual instrument is needed. The monitor needs to be put into service on pilot plant facilities to test and verify the monitor prior to installation on actual plant processes. This will provide data which are needed to design suitable offgas treatment systems for each process. The data will also help develop environmental permitting plans.

Technical Disposition: The TFA responded to this need within the following technical response:

- 99005, Continuous Emissions Monitor for Off-gas Analysis, TFA priority #28.

Site Need ID: ID-2.1.19

Site Need Title: EPA Methods Sample Collection and Analysis Verification/Development

Need Summary: Testing is needed to demonstrate that the EPA methods are valid for moist offgas that also has a high partial pressure of nitrogen oxides (NOx) and acid vapors. It may be necessary to adapt the EPA methods and laboratory analysis techniques for some streams. Testing should address sampling accuracy, precision, results reproducibility, and constituent detection limits. Demonstration of the EPA methods on INTEC pilot plant processes will ensure that the processes can be successfully permitted and operated. If modifications to the EPA sampling methods are required, than a timely ruling from EPA can be sought prior to start up of the processes.

Technical Disposition: The TFA responded to this need within the following technical response:

- 99006, EPA Methods Sample Collection and Analysis Verification/Development. A TFA technical response was not developed for this need because it is now being addressed via EM-30 funding in FY99 and potential TFA funding in FY00 would be too late to address the recently accelerated schedule. The need statement addresses the requirement to experimentally verify that EPA protocol SW-846 samplings methods 0023 for semi-volatile organic compounds (SVOC), 0030 for volatile organic compounds (VOC), and 0060 for multiple metals (MMT) will work in off-gases from INTEC thermal processes containing high levels of oxides of nitrogen (NOx).

  Although the most recent modification to the Consent Order (dated July 31, 1998) between the State of Idaho and DOE requires that DOE place the INTEC calciner on stand-by in April 1999, the Governor of Idaho has indicated that the State will revisit the Consent Order schedule if the current sampling efforts prove successful. DOE has mandated that the highest priority in the HLW Program is to obtain valid liquid and off-gas samples prior to April 1999 and about $3,000K is being directed to this effort. It is recommended that HLW Programs reassess this need, based on the progress made in FY99, to determine if there are unresolved or new issues and if TFA support would be needed in the next site needs submission cycle.

Site Need ID: ID-2.1.20
Site Need Title: Tank Annulus/Vault Inspection
Need Summary: The INTEC radioactive waste storage tanks do not meet RCRA secondary containment requirements because the concrete vault surrounding the stainless steel tanks is not compatible with the acid waste. However, the existing tank vault around the spare WM-190 tank could qualify as secondary containment under RCRA, if the waste is rendered non-corrosive.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99075, Tank Inspection and Integrity Techniques for Hanford, SRS, ORR, and INEEL, TFA priority #16.

Site Need ID: ID-2.1.23
Site Need Title: Low-Activity Waste Form Qualification
Need Summary: In-depth information, program costs, and lessons learned are needed from operating sites concerning how to perform and complete waste form qualification for grouted mixed low-level waste. This includes qualification of the grouting process as well as the final waste form.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99019, Conditioning and Immobilization of Low-Activity Waste to Meet Waste Acceptance Criteria, TFA priority #8.

Site Need ID: ID-2.1.24
Site Need Title: Integration/Optimization of High Activity Waste/Low Activity Waste Process Flowsheet
Need Summary: Many alternatives and options are being considered for the treatment and qualification of radioactive wastes located at INTEC for permanent disposal. Adequate evaluation of these options requires that each one have a process flow diagram and associated mass and energy balance. Presently, the flowsheet calculations are performed manually, or with the assistance of several different software applications. Normally, calculations are being performed just for one unit operation and do not link all of the required operations into a process flowsheet. These calculations must be performed again as new data is obtained which clarify assumptions that have been made. An integrated simulation tool(s) is needed to perform these calculations automatically, with minimal effort on the part of the engineer(s) who are tasked with doing this work. This tool(s) would consist of both software and unit operation mathematical models. This provides for more accurate and timely data required for further evaluations.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99009, Integration/Optimization of High Activity Waste/Low Activity Waste Process Flowsheet, TFA priority #21.

Site Need ID: ID-2.1.25
Site Need Title: Ion-Exchange System for Water Runoff

Need Summary: The overall scope of this need is the reduction of waste (radioactive and mixed) from decontamination activities, the optimization of processes, and the development/implementation of alternative waste stream treatments.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99010, Ion-Exchange System for Water Runoff. The need, in part, requests a system that provides cost effective, environmentally safe disposal paths for waste generated from water runoff. Groundwater and groundwater contamination is the charter of the Subcon Focus Area. Minimization of groundwater runoff is not a Tank Focus Area responsibility. Based upon the description of need, it also appears there are commercially available technologies capable of supporting the need, so no real technology development is required. Additionally, the need states that 4,000 gallons/year of water could be diverted from the expensive evaporator operations. It further states that the incremental cost of evaporation is approximately $1/gal. At this price, it does not appear that technology development is warranted.

Site Need ID: ID-2.1.26
Site Need Title: Nested Array Fluidic Sampler for Tank Solution Characterization
Need Summary: A method for sampling waste from waste tanks at the INTEC Tank Farm Facility to fully characterize the waste stored in the tanks is needed. The sampling method must also meet RCRA requirements for representative sampling and minimization of sample degradation during sampling. Currently, the waste is transferred from the tank farm tank to a tank at the New Waste Calcining Facility via a steam jet or airlift, sparged, and then sampled via a sampler which uses an air jet to pull liquid through a sample bottle. The existing sampler system and sample transport system is also designed for small 15ml sample bottles, while up to a liter of sample is needed for some EPA analyses. There is currently concern with the representiveness of the sample and loss of volatile organics during jet/airlift transfer, sparging, and sampling. The State of Idaho recently requested that permitting of facilities at INTEC be accelerated, and waste characterization is needed prior to permitting of the facilities.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99046, Nested Array Fluidic and LDUA Sampler for Tank Waste, TFA priority #27.

Site Need ID: ID-2.1.27
Site Need Title: Blowback Metal Filters for Solids (Calcine) Retrieval
Need Summary: Highly radioactive waste material in the form of granular solids is being stored in bins in seven Calcined Solids Storage Facilities (CSSF). The Settlement Agreement requires a plan that provides for treatment of all calcined waste to produce a waste form suitable for transport to a permanent repository. The material will be transferred to a new processing facility by a dilute phase vacuum pneumatic transport system to meet this requirement. After the solids are separated from the transport air, the air will be HEPA filtered. Used HEPA filters would be a mixed waste. A filter leaching process may be used to remove the hazardous contaminants from the filters, converting them to a low-level waste.

A solids separation system, which minimizes the expense of disposing of used HEPA filters, is needed.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99071, Alternative Filtration Technologies, TFA priority #31.

Site Need ID: ID-2.1.28
Site Need Title: Cs Removal from Newly Generated Liquid Waste
Need Summary: The removal of Cs from newly generated liquid wastes (NGLW) following partial neutralization (pH 2-4) is required to accomplish near term waste management strategies. The removal of Cs from NGLW will be accomplished by ion exchange using inorganic ion exchange sorbents (the current baseline is IONSIV IE-911) or CST. This activity supports the HLW Program at the INEEL which is tasked with the management and treatment of liquid radioactive wastes at the INEEL.

Sorption chemistry and large-scale column designs need to be developed and demonstrated, as well as verified with actual waste feed streams. Cesium removal will be accomplished with inorganic sorbents, primarily CST. Sorption isotherms and column breakthrough tests must be performed to determine sorbent capacity and develop column design parameters.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99019, Conditioning and Immobilization of Low-Activity Waste to Meet Waste Acceptance Criteria, TFA priority #8.

Site Need ID: ID-2.1.29
Site Need Title: Evaluate Chloride Corrosion Potential (LET&D/PEWE/Future Processes)
Need Summary: Waste generated at INTEC has historically been kept acidic (primarily nitric acid) to facilitate further treatment such as evaporation or calcination. The high nitrate concentration and acidic conditions and the ability to dilute high chloride waste with low chloride wastes allow for storage and processing without significant corrosion problems. All waste going to the INTEC liquid waste systems are being minimized such that there is less low chloride waste, while processing of the existing waste in the HLW evaporator and New Waste Calcine Facility still generate waste with high chloride concentrations. In the past, chloride concentrations for wastes going to the Process Evaporative Waste Evaporator (PEWE) have been less than 50 mg/L chloride. With future processing, waste concentrations are expected to be upwards of 250 mg/L chloride. Significant corrosion has already been experienced in the off-gas system for the Liquid Effluent Treatment and Disposal (LET&D) acid fractionator, which processes the overheads from the PEWE. Operation of future wastes to be processed must be modeled, and the effect of the higher chloride concentrations on equipment service life must be evaluated.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99014, Remove/Treat Chlorides (LET&D/PEWE/Future Processes), TFA priority #35.

Site Need ID: ID-2.1.30
Site Need Title: Remove/Treat Chlorides (LET&D/PEWE/Future Processes)
Need Summary: Waste generated at INTEC has historically been kept acidic (primarily nitric acid) to facilitate further treatment such as evaporation or calcination. The high nitrate concentration and acidic conditions and the ability to dilute high chloride waste with low chloride wastes allow for storage and processing without significant corrosion problems. All waste going to the INTEC liquid waste systems are being minimized such that there is less low chloride waste, while processing of the existing waste in the HLW evaporator and New Waste Calcine Facility still generate waste with high chloride concentrations. Current tank farm wastes have up to 1500 mg/L chloride. In the future, wastes are projected to have up to 5000 mg/L chloride. This will cause problems with storage. In the past, chloride concentrations for wastes going to the Process Evaporative Waste Evaporator (PEWE) have been less than 50 mg/L chloride because dilute chloride wastes were available. With future processing, waste concentrations for PEWE are expected to be upwards of 250 mg/L chloride and due to waste minimization efforts, less low chloride wastes is available. Significant corrosion has already been experienced in the off-gas system for the LET&D acid fractionator which processes the overheads from the PEWE. Some form of chloride removal or treatment will be necessary to process future wastes.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99014, Remove/Treat Chlorides (LET&D/PEWE/Future Processes), TFA priority #35.

Site Need ID: ID-2.1.31
Site Need Title: Characterization of Entrainable Solids in Tank Waste
Need Summary: Liquid waste raffinates resulting from nuclear fuel reprocessing are presently being stored in concrete encased stainless steel underground tanks. Entrainable solids present in these tanks must be removed prior to waste treatment processes such as ion-exchange and solvent extraction. Prior to solving any solid/liquid separation problem, it is essential to know the characterization of entrainable particles (solids) involved in the system. Several factors of particle characterization exist; they include particle size, shape, strength, distribution, concentration, chemical composition and radioactivity. Little or no characterization of in-tank, entrainable solids has been performed. Analysis of these solids must be performed in order to select the proper solid-liquid separation technology. Various factors such as particle size and concentration greatly affect the separation process, and must be considered in the design stage. A solid-liquid separation technology cannot be chosen or implemented until these factors are determined.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99016, Characterization of Entrainable Solids in Tank Waste and Solids from Calcine Dissolution. The TFA did not develop a technical response for this need based on preliminary TFA responses generated by INEEL. Needs statements ID-2.1.31 and ID-2.1.52 address the need to characterize physical properties (i.e., particle size distribution and rheology), wt% composition, chemical composition, and radiological content of undissolved solids in existing tank waste and from the future dissolution of calcine. Characterization of the solids are needed to select

the proper filtration technology for suspended solids removal to avoid fouling the waste pretreatment processes, such as solvent extraction and ion exchange, and to determine compatibility of the solids with the disposal waste form matrix.

It was determined that there was little or no R&D component associated with ID-2.1.31. INEEL indicated that the tank waste undissolved solids would be dissolved and routine hot-cell methods in the RAL would be used for analysis. In further site discussions, it was concluded that the low priority assigned by INTEC to need ID-2.1.52 and the site specific nature of the need would make it an unlikely candidate for TFA funding. Given the low probability of TFA funding for these needs, it was decided not to expend effort in generating technical responses for the current site needs submission cycle. However, TFA recommends that INEEL reassess these needs in the next site needs submission cycle.

Site Need ID: ID-2.1.35
Site Need Title: Direct Immobilization of INTEC Sodium-Bearing Waste
Need Summary: A method to directly immobilize and stabilize liquid sodium-bearing waste (SBW) is needed. SBW is extremely acidic and high in nitrates, sodium, and aluminum. "Direct" means the liquid waste would be added to the solidifying agents, such as grout, without excessive processing; the processes of evaporation and acid neutralization would be acceptable. The waste product must meet applicable waste acceptance criteria for TRU waste or Low-Level Class C waste. Two methods of direct grouting SBW using Portland cement, blast furnace slag, and fly ash have been tested at 40 weight percent waste. It is desired to find a method to improve waste loading and reduce total waste volume.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99019, Conditioning and Immobilization of Low-Activity Waste to Meet Waste Acceptance Criteria, TFA priority #8.

Site Need ID: ID-2.1.36
Site Need Title: Mercury Removal from Liquid Wastes
Need Summary: The liquid radioactive waste being stored at INTEC contains mercury. Processing this waste by calcination, or by proposed separations processes involving denitration of HAW and LAW, will volatilize greater than 90% of the mercury. Measurements made during past calcination campaigns have indicated that (1) mercury accumulates in offgas scrub solutions, and (2) mercury emissions from calcination will exceed future limits expected to be imposed by the new MACT rules. Technology is required to remove mercury from offgas scrub solutions in order to reduce mercury emissions, decrease the mercury load on downstream mercury sorbents, and reduce mercury buildup in stored scrub solutions. A basic understanding of the behavior of mercury in nitric acid solutions containing chloride is required in order to develop a removal method.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99018, Removal of Mercury from NWCF Scrub Solutions, TFA priority #26.

Site Need ID: ID-2.1.38
Site Need Title: Conditioning of Low Activity Waster for Treatment
Need Summary: High-level waste (HLW) calcine and sodium-bearing wastewater at the INTEC require conditioning and treatment prior to storage/disposal in an approved repository. To minimize the volume of remotely handled HLW that must be discarded, the waste streams will be separated into high activity (HAW) and low activity waste (LAW) fractions, using one or more chemical processes. Calcine will be retrieved from storage bins, dissolved in nitric acid, and processed to remove most of the non-radioactive constituents, which will constitute the LAW fraction. Current expectations are that the LAW fraction will be immobilized on-site in a Portland cement-based grout. However, an EIS alternative is to ship the conditioned LAW off-site for immobilization. Conditioning will be required to minimize the ultimate volume of LAW grout and to ensure that the grout will properly cure and meet performance criteria. Composition of the LAW fraction would vary depending on the feed solutions that are processed through the separations plant.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99019, Conditioning and Immobilization of Low-Activity Waste to Meet Waste Acceptance Criteria, TFA priority #8.

Site Need ID: ID-2.1.39
Site Need Title: Acceptance Criteria for LAW Disposal in Underground Storage Tanks
Need Summary: Waste acceptance criteria must be developed and approved to use the underground storage tanks as low-level Class A waste disposal sites. Any operating experience or lessons learned from other sites on this subject is needed.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99023, Idaho Tank WM-182 Closure Demonstration, TFA priority #9.

Site Need ID: ID-2.1.40
Site Need Title: Low Activity Waste Grout Sorbent Addition to Reduce Leachability
Need Summary: Research information is needed concerning the addition of chemical sorbents to grouted waste to reduce the leachability of radionuclides and RCRA metals from the waste.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99019, Conditioning and Immobilization of Low-Activity Waste to Meet Waste Acceptance Criteria, TFA priority #8.

Site Need ID: ID-2.1.41
Site Need Title: HLW Process Offgas Treatment
Need Summary: This needs statement addresses the development of control technologies for products of incomplete combustion (PICs) and NOx; whereas control technologies for Hg emissions are addresses in a separate needs statement. Abatement technologies for particulate and acid vapors are considered mature; therefore, a survey of commercially available control systems is needed to identify the best of existing technologies to include in

process feasibility studies. Consideration must be given to the fact that these are radiological processes.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99022, HLW Process Off-Gas Treatment. The TFA did not develop a technical response for this need as it is currently being addresses by the Mixed Waste Focus Area by testing being performed at the MSE facilities in Butte, Montana.

Site Need ID: ID-2.1.42
Site Need Title: Acceptance Criteria for Tank Closure
Need Summary: Tank closure acceptance criteria needs to be developed to meet RCRA Landfill Closure Standards and State approval in support of the closure plans. This requires not only the development of criteria, but also development of the process needed to ascertain compliance with those criteria.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99101, Tank Closure Strategy, TFA priority #39.
- 99023, Idaho Tank WM-182 Closure Demonstration, TFA priority #9.

Site Need ID: ID-2.1.43
Site Need Title: Certify LDUA Sampler as EPA-Approved Method of Sampling Tank Heel Liquids
Need Summary: Sampling tank farm waste is required to support tank closure, delisting, and CERCLA source term definition. Currently, the tank farm waste is sampled after transfer to an adjacent facility. However, the solution must be transferred by steam jet and air lifted to the sampler. This does not meet SW-846 criteria. A new method of directly sampling the tank farm heels and solution with a robotic arm is being demonstrated. However, the sampler employed by this arm does not meet SW-846 criteria for organics in that the sample chamber is evacuated to draw a sample. Demonstration that the sampler provides a truly representative sample of the tank heels and solution will allow INTEC to employ the robotic arm in sampling wastes to support tank closure, delisting and CERCLA source term definition. If modifications to the EPA sampling methods are required, than a timely ruling from EPA can be sought to support closure, delisting and source term definition.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99046, Nested Array Fluidic and LDUA Sampler for Tank Waste, TFA priority #27.

Site Need ID: ID-2.1.44
Site Need Title: Certify LDUA Sampler as EPA-Approved Method of Sampling Tank Heel Solids
Need Summary: Sampling tank farm waste is required to support tank closure, delisting, and CERCLA source term definition. Currently, the tank farm waste is sampled after transfer to an adjacent facility. However, the solution must be transferred by steam jet and air lifted to the sampler. This does not meet SW-846 criteria. A new method of directly sampling the tank farm heels and solution with a robotic arm is being demonstrated. However, the

sampler employed by this arm does not meet SW-846 criteria for organics because the sample chamber used is evacuated to draw a sample. Demonstration that the sampler provides a sample truly representative of the tank heels and solution will allow INTEC to employ the robotic arm in sampling wastes to support tank closure, delisting and CERCLA source term definition. If modifications to the EPA sampling methods are required, than a timely ruling from EPA can be sought to support closure, delisting and source term definition.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99046, Nested Array Fluidic and LDUA Sampler for Tank Waste, TFA priority #27.

Site Need ID: ID-2.1.45
Site Need Title: Acceptance Criteria for Grouting Tank Heels
Need Summary: Closure acceptance criteria for the tank heels is needed to design tank closure plans and determine the method to immobilize and stabilize the heels. SRS closed two tanks. Any licensing and operating experience or lessons learned from SRS is needed.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99023, Idaho Tank WM-182 Closure Demonstration, TFA priority #9.

Site Need ID: ID-2.1.46
Site Need Title: Management of Tank Heel Liquids
Need Summary: Currently, INEEL's tanks can only be emptied to the heel level, due to the level of the steam jets used to empty the tanks. Therefore, several gallons of waste will still remain in the tanks when they are no longer being used. INEEL plans to close these tanks by grouting the heels in place. This poses some technical and regulatory challenges. The liquid heels are acidic and may not be conducive to direct grouting due to the chemistry and lack of mixing capabilities. In order to form a grouted waste and meet RCRA Landfill Closure Standards and State negotiated acceptance criteria, the liquid heels may have to be diluted, neutralized, reduced in volume, or totally removed. There is currently no mechanism to accomplish either neutralization or liquid heel removal, nor has it been proven that the liquid heel can be grouted in place. Therefore, development work is needed to first determine what must be done to manage these liquids to meet tank closure criteria (dilution, neutralization, reduced in volume, removed, etc.) and then how that can physically be accomplished.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99023, Idaho Tank WM-182 Closure Demonstration, TFA priority #9.
- 99101, Tank Closure Strategy, TFA priority #39.

Site Need ID: ID-2.1.47
Site Need Title: Management of Tank Heel Solids
Need Summary: Currently, INEEL's tanks can only be emptied to the heel level, due to the level of the steam jets used to empty the tanks. Therefore, several gallons of waste will still remain in the tanks when they are no longer being used. INEEL plans to close these tanks by grouting the heels in place. This poses some technical and regulatory challenges. The heels

contain some solids, both suspended and settled. These solids must be managed from a risk-based standpoint, in that they contribute to the radioactive source term, which is a limiting factor in various closure options. In order to meet RCRA Landfill Closure Standards, these solids may have to be washed or removed to reduce the source term and risk. In addition, it must be shown that the solids can be adequately stabilized by grouting them in place. If the grout merely forms a layer on top of the solids, in situ grouting of the solids may not meet closure criteria. Again, the solids may need to be removed. There is currently no mechanism to accomplish either washing or removal of solids in the tanks, nor has it been proven that the solids can be grouted in place. Therefore, development work is needed to first determine what must be done to manage these solids to meet tank closure criteria (washing, removal, grout encapsulation, etc.) and then how that process can physically be accomplished.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99023, Idaho Tank WM-182 Closure Demonstration, TFA priority #9.
- 99101, Tank Closure Strategy, TFA priority #39.
- 99067, Tank Heel Retrieval Technology, TFA priority #4.

Site Need ID: ID-2.1.48
Site Need Title: Waste Form Qualification for Low-Activity Waste in Underground Storage Tanks
Need Summary: In-depth grout development work will be required to determine formulation and operational constraints which will provide acceptable curing conditions and simultaneously assure optimized final grout performance requirements (leachability, strength, etc.). In-depth information, program costs, and lessons learned are needed from operating sites concerning how to perform and complete waste form qualification for grouted, mixed low-level waste. This includes qualification of the grouting process as well as the final waste form. Completion of HLW Technology Needs ID # 2.1.39 (Acceptance Criteria for LAW Disposal in Tanks) will be required prior to full completion of this need.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99023, Idaho Tank WM-182 Closure Demonstration, TFA priority #9.

Site Need ID: ID-2.1.49
Site Need Title: Acceptance Criteria for High Activity Waste/Low Activity Waste
Need Summary: During FY00, this task begins to apply of experience at other DOE sites to the establishment of an acceptance/qualification system for INEEL/INTEC HAW and LAW. This includes development of a qualified records management systems, required verification documents, and qualified testing/verification protocol. Thus, this task evolves into establishing an administrative system that (1) Applies the WASRD/WAPS requirements for disposal to the development of an immobilization process for INTEC/INEEL HAW, (2) Applies the 10 CFR 61 requirements for disposal to the development of an immobiliztion process for INTEC/INEEL LAW, (3) Anticipates any future RCRA requirements that may apply to the disposal of HAW and LAW, and (4) Develop the entire waste acceptance/qualification system in a manner that conforms to DOE's Record of Decision which will identify the means by which INEEL/INTEC HLW is immobilized. A preliminary waste form compliance plan was established in FY97 to describe how the INTEC HAW will

be rendered suitable for disposal in a federal geologic repository. In FY00, this task also has the purpose of updating the INTEC preliminary waste form compliance plan to reflect the development of the process to be applied for immobilizing INEEL/INTEC HAW. This program also has the task of developing parallel documentation, as defined in 10 CFR 61, that describes how LAW will be made suitable for shallow land disposal.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99030, Acceptance Criteria for High Activity Waste/Low Activity Waste. It does not appear that technology development is required to meet this need. Therefore, an approach to meet this need is for Idaho to meet with SRS and WVDP to understand how these sites developed methods and administrative systems for meeting the requirements necessary to demonstrate compliance prior to disposal of HLW and LAW. The results of current efforts at Hanford on disposal of their LAW in an on-site shallow land burial site would also be useful. This involves the iterative process between the Performance Assessment and the development of waste acceptance criteria. The TFA can provide technical assistance to ensure INEEL has the appropriate contacts at SRS, WVDP, and Hanford.

Site Need ID: ID-2.1.50
Site Need Title: Solids Waste (Calcine) Retrieval
Need Summary: Highly radioactive waste material in the form of granular solids or powder is being stored in bins in CSSF. Some of the material may have formed a relatively weak crust or cake while in storage. Systems are needed to retrieve the calcined solids out of storage bins and transfer them to a processing facility, so they can be processed into a more stable waste form.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99031, Dry Solid Wastes Retrieval, TFA priority #30.

Site Need ID: ID-2.1.51
Site Need Title: Develop Calcine Dissolution Kinetics for Solid/Liquid Equilibria
Need Summary: In order to scale-up and design calcine dissolution equipment, a dissolution reaction rate expression is required for integration in an appropriate reactor performance equation. This dissolution rate expression will model heterogeneous reactions and accommodate the possibilities for the rate controlling phenomena. This will be accomplished by integrating the following parameters of (1) the surface reaction rate constant and its dependence on temperature, (2) the external film mass transfer coefficient and its dependence on agitation power input, and (3) the internal effective diffusion coefficient. These parameters are required for scale-up and design of a calcine dissolution reactor. In addition, this model will predict the extent of the dissolution and the dissolver product solids/liquid equilibria. Also, on occasion, dissolution of calcine material has been required to support ongoing INTEC calcination operations. This calcine dissolution work may provide useful information for any future operations where calcine requires dissolution in a setting other than a calcine dissolution reactor.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99032, Develop Calcine Dissolution Kinetics for Solid/Liquid Equilibria, TFA priority #29.

Site Need ID: ID-2.1.52
Site Need Title: Characterization of Solids from Calcine Dissolution
Need Summary: The residual or undissolved solids (UDS) from the dissolution process must be segregated from the liquid stream input to the downstream separation process since they cause problems in operational aspects of the separation process and can provide a source of significant contamination in the LLW fraction from separations. Data obtained to date indicates the UDS from the dissolution process will be intensely radioactive, thus requiring disposal with the HLW fraction and emphasizing the need for efficient solids removal from the liquid dissolver product. In order to efficiently remove or filter the solids from the liquid stream, physical characteristics of the UDS, such as particle size distribution, must be determined. Physical characterization must be established prior to selecting a solids removal system. Due to the intense radioactivity of the solids, characterization must be performed in a remote environment. Finally, chemical characterization of the UDS is required to establish compatibility with the HLW final waste form.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99016, Characterization of Entrainable Solids in Tank Waste and Solids from Calcine Dissolution. The TFA did not develop a technical response for this need based on preliminary TFA responses generated by the INEEL. Needs statements ID-2.1.31 and ID-2.1.52 address the need to characterize physical properties (i.e., particle size distribution and rheology), wt% composition, chemical composition, and radiological content of undissolved solids in existing tank waste and from the future dissolution of calcine. Characterization of the solids are needed to select the proper filtration technology for suspended solids removal to avoid fouling the waste pretreatment processes, such as solvent extraction and ion exchange, and to determine compatibility of the solids with the disposal waste form matrix.

  It was determined that there was little or no R&D component associated with ID-2.1.31. INEEL indicated that the tank waste undissolved solids would be dissolved and routine hot-cell methods in the RAL would be used for analysis. In further site discussions, it was concluded that the low priority assigned by INTEC to need ID-2.1.52 and the site specific nature of the need would make it an unlikely candidate for TFA funding. Given the low probability of TFA funding for these needs, it was decided not to expend effort in generating technical responses for the current site needs submission cycle. However, TFA recommends that INEEL reassess these needs in the next site needs submission cycle.

Site Need ID: ID-2.1.53
Site Need Title: Cs Removal from High Activity Wastes
Need Summary: The removal of Cs from HAW is required to accomplish waste treatment strategies. This activity supplies waste stream feeds for vitrification and grouting programs. The removal of Cs from HAW will be accomplished by ion exchange using inorganic ion

exchange sorbents. This activity supports the HLW program at the INEEL which is tasked with the management and treatment of HLW at the INEEL.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99098, Alkaline Solvent Extraction, TFA priority #40.
- 99001, TRU, Sr and Cs Removal from INEEL Wastes, TFA priority #18.

Site Need ID: ID-2.1.54
Site Need Title: TRU Removal from High Activity Wastes
Need Summary: The removal of TRU HAW is required to accomplish waste treatment strategies. This activity supplies waste stream feeds for vitrification and grouting programs. The removal of TRU from HAW will be accomplished by transuranic solvent extraction technology (TRUEX). This activity supports the HLW Program at the INEEL, which is tasked with the management and treatment of high level wastes at the INEEL. The flowsheet design needs to be developed and demonstrated, as well as verified with actual waste feed streams. Study of fluorine/zirconium chemistry is an integral part of the technology development effort, to minimize zirconium carryover to the HLW fraction.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99001, TRU, Sr and Cs Removal from INEEL Wastes, TFA priority #18.

Site Need ID: ID-2.1.55
Site Need Title: Sr Removal from High Activity Wastes
Need Summary: Large volumes of liquid wastes stored in non-compliant tanks and solid wastes in limited-life bins at the INEEL present a challenge for retrieval and permanent disposal. Estimates for the cost of directly disposing of these wastes are very large. A thorough systems analysis of the factors influencing various option for disposal of the waste strongly indicate that there is a very large cost benefit to separating the radionuclides from the inert waste matrix. These cost benefits are obtained through operational and interim storage costs, as well as costs associated with the transport and disposal of the wastes. This approach is dependent on the development of technologies which can accomplish large decontamination factors for the long-lived transuranic elements and fission products.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99001, TRU, Sr and Cs Removal from INEEL Wastes, TFA priority #18.

Site Need ID: ID-2.1.56
Site Need Title: Mercury Treatment for Aluminum Calcine
Need Summary: The removal of Hg from high activity Al calcines is required to accomplish waste treatment strategies at INEEL. Mercury can foul downstream separation processes if not removed, and will volatilize in thermal treatment processes, complicating process design and equipment and increasing costs. The removal of Hg from Al calcine will be accomplished by TRUEX and/or SREX process solvents or an upstream ion exchange sorbent. This activity supports the HLW program at the INEEL which is tasked with the management and treatment of HLW at the INEEL. The final disposition of Hg (in LLW or HLW streams) will need to be resolved.

Removal of Hg may be accomplished via solvent extraction technology or ion exchange. The sorption chemistry and flowsheet design needs to be developed and demonstrated, as well as verified with actual waste feed streams. Mercury distribution in TRUEX and SREX solvent extraction flowsheets will be verified. Removal of mercury from solvent wash streams (sodium carbonate) is also required.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99018, Removal of Mercury from NWCF Scrub Solutions, TFA priority #26.

Site Need ID: ID-2.1.57
Site Need Title: Conditioning of HAW for Treatment
Need Summary: HLW calcine and sodium-bearing wastewater at the INTEC require conditioning and treatment prior to storage/disposal in an approved repository. To minimize the volume of remotely handled HLW that must be discarded, the waste streams may be separated into HAW and LAW fractions, using one or more chemical processes. Calcine would be retrieved from storage bins, dissolved in nitric acid, and processed to remove most of the radioactive constituents (fission products and transuranics), which would constitute the HAW fraction. Current expectations are that the HAW fraction will be immobilized by vitrification on-site. However, an EIS alternative is to ship the conditioned HAW off-site for immobilization. Conditioning will be required to minimize the ultimate volume of HAW glass and to ensure that the glass will meet performance criteria. Composition of the HAW fraction may vary somewhat, depending on the feed solutions that are processed through the separations plant.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99068, Improve Performance and Design of HLW Melters, TFA priority #1.

Site Need ID: ID-2.1.58
Site Need Title: HAW Immobilization
Need Summary: The needs consist of the following items: (1) determination on a small scale basis that glass forming additives can vitrify the HLW to a form that has physically and chemically acceptable properties for repository storage, (2) after demonstrating that the candidate vitrifying formulations are processable, development of a process to convert the waste on a full-scale basis to the glass form suitable for repository storage, and (3) establishment of an administrative system to collect information and data that proves the suitability of the vitrified product.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99099, INEEL Calcine Direct Immobilization, TFA priority #45.
- 99073, Improve Waste Loading and HLW Glass, TFA priority #5.
- 99068, Improve Performance and Design of HLW Melters, TFA priority #1.

Site Need ID: ID-2.1.62
Site Need Title: Acceptance Criteria for Bin Set Closure

Need Summary: Bin set closure acceptance criteria for INEEL are needed as soon as possible so that technologies needed to achieve final closure can be determined. Bin set closure must consider RCRA requirements, NRC requirements, and the Settlement Agreement. Although the Settlement Agreement implies that "all calcined waste" must be removed from the bins, it is likely that the risk to the environment from some residual amount of calcine in the bins will be less than the risk of removing it. The bin set closure acceptance criteria are needed as soon as possible to develop needed technologies. Bin set closure is similar to any HLW tank closure in the sense that the goal is to minimize the risk of releasing hazardous or radioactive material to the environment. SRS has experience with tank closure. Any licensing and operating experience or lessons learned from SRS are needed.
Technical Disposition: The TFA responded to this need within the following technical response:

99023, Idaho Tank WM-182 Closure Demonstration, TFA priority #9.

Site Need ID: ID-2.1.63
Site Need Title: Universal Solvent Process for TRU, Cs and Sr Removal
Need Summary: The removal of radioactive actinides, Cs and Sr, from HAW is required to accomplish waste treatment strategies at INEEL. This activity supplies waste stream feeds for vitrification and grouting programs. The removal of radionuclides from HAW will be accomplished in an integrated test involving three separate unit operations. This activity supports the HLW program at the INEEL which is tasked with the management and treatment of HLW at the INEEL.

The removal of radionuclides may be accomplished via solvent extraction technology which has been under development by the DOE-EM programs for ten years. The cobalt dicarbolide universal solvent process will be used to develop working flowsheets for demonstration and implementation in centrifugal contractor equipment. This chemistry and flowsheet design needs to be developed and demonstrated, as well as verified with actual waste feed streams. This technology provides significant cost savings over separation processes utilizing single unit operations. One process instead of three for TRU, Sr, and Cs removal will reduce capital and operating costs.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99098, Alkaline Solvent Extraction, TFA priority #40.
- 99041, Universal Solvent Process for TRU, Sr and Cs Removal, TFA priority #46.

Site: ORR

Site Need ID: OR-TK-01
Site Need Title: Tank Waste Characterization
Need Summary: ORR has 150,000 gal of remote-handled (RH)-transuranic (TRU) sludge stored in thirteen 50,000-gal horizontal stainless steel tanks (Bethel Valley Evaporator Service Tanks (BVEST) and Melton Valley Storage Tanks (MVST) which are located in vaults. The amount of sludge in inventory for private sector treatment needs to be better defined. Methods for accurately determining the amount of sludge remaining in the tanks

after retrieval are needed. Better sampling methods are needed to determine overall tank sludge compositions. Technologies are needed to determine the structural integrity of the tanks prior to and after sludge retrieval by the private sector in order for the tanks to be put back into active service.

Similar sludge sampling and tank inspection capabilities are required for a variety of Federal Facility Agreement (FFA) tanks. These tanks are generally made of stainless steel, but they have a variety of configurations. The 50–500 gal tanks all have limited access.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99043, High Level Waste Tank Corrosion Control and Monitoring, TFA priority #3.
- 99075, Tank Inspection and Integrity Techniques for Hanford, SRS, ORR, and INEEL, TFA priority #16.

Site Need ID: OR-TK-02
Site Need Title: Tank Solid Waste Retrieval
Need Summary: Process heels, hard sludge, and debris from the inside of old concrete storage tanks must be removed in order to remediate the tanks at ORR. Concrete walls which are contaminated from contact with radiological materials must be cleaned.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99082, Horizontal and Small Tank Sludge Mixing and Mobilization, TFA priority #13.
- 99052, Technologies for Pit Operation Enhancement, Remote Operations/Maintenance, and Disassembly, TFA priority #22.
- 99054A, Prevention of Solids Formation, TFA priority #2.
- 99067, Tank Heel Retrieval Technology, TFA priority #4.

Site Need ID: OR-TK-03
Site Need Title: Sludge Mixing and Mobilization
Need Summary: Systems to mix and mobilize bulk quantities of sludge in ORNL horizontal steel underground tanks with limited access are needed to support waste treatment programs.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99082, Horizontal and Small Tank Sludge Mixing and Mobilization, TFA priority #13.

Site Need ID: OR-TK-04
Site Need Title: Sludge Mixing and Slurry Transport
Need Summary: A system to transport bulk quantities of sludge from ORNL underground tanks through miles of pipeline to consolidation tanks and treatment facilities is needed. Monitoring of the retrieved sludge is required to eliminate plugging and ensure slurry content.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99078, In-Tank Wt% Suspended Solids Probe and Slurry Monitors, TFA priority #24.
- 99084, Solid-Liquid Separations-MVST, TFA priority #19.

Site Need ID: OR-TK-05
Site Need Title: Tank Sludge and Supernatant Separations
Need Summary: ORNL needs to manage the excess water generated during sludge retrieval operations. Sludges and supernate/sluice water must be separated in a fast, cost-effective manner during waste transfer and treatment operations.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99084, Solid-Liquid Separations—MVST, TFA priority #19.

Site Need ID: OR-TK-06
Site Need Title: Tank Sludge Supernatant Immobilization
Need Summary: The baseline plan for concentration and treatment of ORNL tank waste is to remove cesium from the supernate by ion exchange and grout the waste for disposal at NTS, and to solidify sludge for disposal at NTS or WIPP. Pretreatment may be required to meet the feed envelope required by the immobilization vendor. Waste form development is required to meet LDR requirements.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99019, Conditioning and Immobilization of Low-Activity Waste to Meet Waste Acceptance Criteria, TFA priority #8.

Site Need ID: OR-TK-09
Site Need Title: Tank Closure
Need Summary: Old deteriorating waste storage tanks exist at ORR which contain sludge heels that have been determined to be of negligible risk to health, safety, and environment. However, it will be very costly to remove the waste from tanks with limited access ports. Residual waste in the concrete walls and liners of the waste tanks may also dictate the need for tank closure. A technology is needed for in situ stabilization of these sludge heels as a part of tank closure. Fill material which can meet acceptance criteria for tank closure is also required. Pre- and post-closure monitoring are needed.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99085, Demonstration of Grout Injection Technology for Tank Closure, TFA priority #10.
- 99101, Tank Closure Strategy, TFA priority #39.

Site Need ID: OR-TK-11
Site Need Title: Tank Supernatant Pretreatment
Need Summary: The baseline plan for treatment of ORNL tank waste is to remove cesium from the supernate by ion exchange and grout the waste for disposal at the NTS, and to solidify sludge for disposal at NTS or WIPP. However, pretreatment to remove certain

radionuclides and/or to reduce the volume of high-activity TRU waste may be required, particularly if WIPP does not gain approval to accept remote-handled TRU waste.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99086, Evaporation/Cesium Removal at ORNL, TFA priority #7.

Site: SRS

Site Need ID: SR99-1011
Site Need Title: Demonstrate Evaporation Technologies to Reduce Generation of Secondary Waste Volume from Consolidated Incineration Facility
Need Summary: The Consolidated Incineration Facility (CIF) capacity for treating some waste streams is limited by the secondary waste stabilization system at SRS. Using evaporation to reduce the generation of secondary liquid waste will allow the CIF to treat projected waste volumes while minimizing the quantity of secondary waste requiring stabilization and disposal. An evaporation system to significantly increase the Total Dissolved Solids (TDS) and Total Suspended Solids (TSS) concentrations in the Air Pollution Control System (APCS) quench water prior to discharge as secondary waste. This will reduce secondary waste generation and improve CIF treatment capacity.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99086, Evaporation/Cesium Removal at ORNL, TFA priority #7.

Site Need ID: SR99-2027
Site Need Title: Demonstrate Alternative Filtration Technologies to Replace HEPA Filters
Need Summary: Washable HEPA filter technology is required to increase the life of HLW tank HEPA filters and to reduce the solid waste volume associated with spent paper filters. An alternative filtration technology, such as a HEPA filter constructed of sintered stainless steel, will provide a HEPA filter which is not subject to water damage and can be installed with built in water jets used to wash the filter to reduce radiation and eliminate dirt accumulation.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99071, Alternative Filtration Technologies, TFA priority #31.

Site Need ID: SR99-2028
Site Need Title: Alternative Waste Removal Technology
Need Summary: Improved removal technology is needed to remove salt waste from the HLW storage tanks at SRS. Conventional waste removal techniques using 150HP slurry pumps are considered costly and overly invasive. As a follow-on to extensive alternate mixing equipment (Flygt Mixer) testing in FY98 and 50HP Flygt mixer deployment in FY99, additional Flygt mixer development, testing and deployment is needed in FY00. The focus of this follow-on Flygt mixer program will include evaluations of mixer sizing and operational strategies for salt dissolution for salt removal. Testing will determine the deployment operational strategies and orientation for mixing in SRS Type I, II, and III tanks that contain cooling coils and other physical obstructions.

Technical Disposition: The TFA responded to this need within the following technical response:

- 99059, Hanford/SRS Waste Mixing and Mobilization, TFA priority #23.

Site Need ID: SR99-2029
Site Need Title: Alternative DWPF Canister Decon Technology
Need Summary: A new more effective technology is required to decontaminate DWPF canisters after they are filled and welded. DWPF canister decontamination is a water-frit slurry blast technique that removes contamination and oxides from the entire canister exterior surface. The waste from this process is in two forms. An off-gas is routed to the facility vessel ventilation system and on to facility controlled ventilation exhaust. A water-frit slurry waste stream is pumped into the facility chemical process system and fed into the vitrification process stream, to minimize liquid waste production. This coupling of canister decontamination with chemical processing is less than optimum and could limit production rates in the future.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99072, Alternative DWPF Canister Decontamination Techniques, TFA priority #32.

Site Need ID: SR99-2031
Site Need Title: Develop Remote Technology to Improve DWPF Operations
Need Summary: The DWPF at SRS needs new and enabling robotic/remote equipment to perform needed operations in the DWPF process cells. The DWPF is limited in the ability to perform remote maintenance, inspection, and cleanup activities within the shielded facility (canyon). The only access to the majority of the facility for maintenance, etc., is via an overhead crane using hooks and an impact wrench. Viewing capability within the facility is limited to video cameras mounted on the Main Process Cell (MPC) crane. It is desirable to develop improved capabilities to inspect, perform maintenance, and perform decontamination/cleanup activities within the facility.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99074, Develop Remote Technology to Improve DWPF Operations, TFA priority #47.

Site Need ID: SR99-2032
Site Need Title: Optimize Melter Glass Chemistry
Need Summary: DWPF complies with Waste Acceptance Product Specifications and process control requirements control by demonstrating, to a high confidence, that melter feed will produce glass that meets all quality and processing requirements at SRS. This method requires that uncertainties associated with sampling, sample analysis and models used to estimate properties be determined and that sufficient allowance is made for these uncertainties when controlling feed composition.

The existing model for liquidus temperature contains a large uncertainty and its application has led to reduction in allowable waste loading. Some constraints on the application of the

durability model can cause acceptable feed batches to be rejected, because the durability is indeterminate (i.e., the applicability of the model is not certain).
Technical Disposition: The TFA responded to this need within the following technical response:

- 99073, Improve Waste Loading and HLW Glass, TFA priority #5.

Site Need ID: SR99-2033
Site Need Title: Provide Alternative Processing and/or Concentration Methods for DWPF Recycle Aqueous Streams
Need Summary: Technology is required at SRS to process the DWPF recycle stream to reduce the volume of waste being stored in the HLW tank farm. The DWPF recycles about 7.5 gpm aqueous stream to the tanks farms for evaporation. The stream consists of the following average composition: H2O-94.7%; NaOH 4.0%; NaNO3 0.3%; NaNO2 0.6%; NH3 300 PPM; Misc. inorganics 0.3%; Misc. Organics 700 PPM. In addition, the stream contains sludge solids and glass particulates from melter offgas fines and from process sample recycle. The gamma curie content is approximately 2 curies/gal., primarily Cs-137. Incremental costs of processing this material in the tank farm are 78 cents/gal, not including ITP batching costs. However, if ITP does not start on schedule at reasonable attainment levels, tank farm storage capacity in new style tanks will become critical and may cause DWPF to stop operations.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99066, Provide Alternative Processing and/or Concentration Methods for DWPF Recycle Aqueous Streams. The TFA is screening out this need at this time. The primary site focus is on Salt Disposition and the DWPF is a low priority.

Site Need ID: SR99-2034
Site Need Title: Second Generation Salt Feed Preparation
Need Summary: There are significant science and technology questions and issues which must be answered to complete design and construction activities at SRS in a time frame which allows HLW tank decommissioning in accordance with compliance agreements with the State of South Carolina and the EPA. These technology assurance issues must be addressed in concert with the overall SRS Salt Disposition Project activities. Science and technology is needed to support design and construction in the following three basic categories: process chemistry, process engineering, and HLW system interface.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99098, Alkaline Solvent Extraction, TFA priority #40.
- 99070, Salt Cesium Separation Processes, TFA priority #12.

Site Need ID: SR99-2035
Site Need Title: Develop Advanced Techniques for Life Extension of High Level Waste Tanks and Piping
Need Summary: Provide inspection technology to assure the continued integrity of SRS HLW tank and pipeline systems for another 30 years of expected operation. Small roving

equipment is needed to inspect the annulus space of older tanks. Photographic inspection equipment can be used to ensure the integrity of waste transfer piping systems.
Data archiving of video and inspection information is in need of updating.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99075, Tank Inspection and Integrity Techniques for Hanford, SRS, ORR, and INEEL, TFA priority #16.
- 99076, Waste Transfer Line Plugging Prevention and Unplugging Methods, TFA priority #17.

Site Need ID: SR99-2036
Site Need Title: Develop Second Generation DWPF Melter
Need Summary: Improvements to the glass melting system are required to increase reliability of glass pouring behavior in future SRS DWPF melters.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99068, Improve Performance and Design of HLW Melters, TFA priority #1.

Site Need ID: SR99-2037
Site Need Title: Tank Heel Removal/Closure Technology
Need Summary: A smaller slurry pump is needed at SRS to fit through existing risers as small as 22 inches in diameter. Desired features of this "mini-slurry pump" include the ability to mix residual waste heels with a high liquid turbulent free jet discharge rate (5000 gpm) and the capability for relatively simple re-deployment in multiple risers and tanks.

As a follow-on to extensive alternate mixing equipment (Flygt Mixer) testing in FY98 and 50HP Flygt mixer deployment in FY99, additional Flygt mixer development, testing and deployment is needed in FY00. The focus of this follow-on Flygt mixer program will include optimization of extended/reduced shrouds and propeller design to increase discharge velocity and reduce discharge jet dispersion. Testing will determine the deployment operational strategies and orientation for mixing in SRS Type I, II, and III tanks that contain cooling coils and other physical obstructions. The anticipated production of a new compact 100HP Flygt mixer will open new opportunities for testing of applications to support bulk sludge removal.

Development of a low cost remote crawler platform with high-pressure water spray payloads was initiated in FY98. This crawler-hydrolaser is planned for deployment in Tank 19 for residual heel removal in FY99, if necessary. Additional payloads, such as a remote pump suction device, a minimal water usage local sluicer, and other tools for hardened sludge removal, need to be developed in FY00.

Instruments to measure weight percent solids in slurries are needed to optimize sludge waste removal processes. In situ, real-time measurement of weight percent solids will facilitate sludge-rich slurries to improve waste removal process efficiency. Additionally, accurate weight percent solids data will reduce the risk of transfer line pluggage that can occur with high sludge solids content in slurries. Instruments are also needed to provide real time

rheological property data, such as sludge yield stress values, to support mixing equipment deployment.

Bulk waste removal employs up to four slurry pumps and a TTP. These pumps, as well as other equipment, must be removed to allow tank access for sludge heel removal systems. This highly contaminated equipment must be decontaminated for storage and future use or size-reduced for disposal. The inactive 1F Concentrate Transfer System (CTS) pit has been identified as a possible location to conduct decontamination and size-reduction work. The CTS pit is below grade with a steel liner, ventilation, and leak detection. Removal of existing CTS equipment along with decontamination will support retrofitting this currently inactive pit into a valuable decontamination, storage, and equipment size-reduction facility to support sludge heel removal operations. Remotely controlled manipulators can be readily deployed in the CTS pit to handle contaminated equipment. Retrofitting the CTS pit is needed in FY00 to support the accelerated waste removal and tank closure schedule.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99078, In-Tank Wt% Suspended Solids Probe and Slurry Monitors, TFA priority #24.
- 99067, Tank Heel Retrieval Technology, TFA priority #4.
- 99059, Hanford/SRS Waste Mixing and Mobilization, TFA priority #23.
- 99052, Technologies for Pit Operation Enhancement, Remote Operations/Maintenance, and Disassembly, TFA priority #22.

Site Need ID: SR99-2039
Site Need Title: Methods to Unplug Waste Transfer Lines
Need Summary: As the tank clean-out and decommissioning program becomes active at SRS, there is increasing potential that existing transfer lines will become plugged (unable to facilitate waste transfer from one tank to another or from tankage to the DWPF ITP, or Saltstone, etc.).
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99054A, Prevention of Solids Formation, TFA priority #2.
- 99076, Waste Transfer Line Plugging Prevention and Unplugging Methods, TFA priority #17.

Site Need ID: SR99-2040
Site Need Title: Demonstrate Remote Decommissioning and Disassembly of High Level Waste Processing Equipment
Need Summary: Technology is needed to develop remote and/or robotic systems to disassemble contaminated HLW processing equipment. SRS currently does not have the capability to decommission, size reduce, decontaminate, classify and dispose of failed, highly contaminated processing equipment. This includes failed HLW glass melters, process vessels and process equipment. The current approach to dealing with this equipment is long term storage in the canyon facilities, on regulated storage pads or in underground "Failed Equipment Storage Vaults." While storage is acceptable for the short term, technology must be developed to properly dispose of this equipment. This should include dismantling or size

reduction of the equipment, decontamination and recyling of as much material as possible, disposal of the majority of the material as LLW and disposal of remaining HLW materials in a controlled repository or as a recycle stream to tank farms and ultimately the DWPF.

This need does not apply just to SRS. It spans the entire DOE complex wherever highly contaminated equipment is utilized or generated. Robotic and telerobotic technology currently exists which is capable of remote disassembly and decontamination of large equipment. However, much work will be involved in adapting that technology to high-level equipment disposal. The need must be addressed now to ensure that technology is developed and demonstrated to support funding, design and construction of D&D facilities for SRS as well as other DOE sites.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99052, Technologies for Pit Operation Enhancement, Remote Operations/Maintenance, and Disassembly, TFA priority #22.
- 99077, Demonstrate Remote Disassembly of HLW Melters and Other Processing Equipment, TFA priority #6.

Site Need ID: SR99-2041
Site Need Title: Demonstration of Alternative Mixer Technology for HLW Pump Tanks
Need Summary: Demonstrate alternative mixing technologies for use in SRS HLW pump tanks that are used to transfer organic-bearing high level waste. Power Fluidic mixing technology has been demonstrated to be effective in mixing sludge-bearing waste in pump tank geometries, but has not yet been demonstrated for effective mixing of organic layers. However, power fluidic technology is expected to offer advantages over the baseline mechanical agitator technology. It is also a low-risk alternative, and has been proven at nuclear plants in the United Kingdom (UK) for the past 15 to 20 years. The technology has also been deployed at ORR, where it retrieved stored waste from tanks. This use demonstrated that, compared to baseline mechanical agitators, power fluidic technology reduced the cost of operation by 70% and shortened the schedule by more than 50%.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99059, Hanford/SRS Waste Mixing and Mobilization, TFA priority #23.

Site Need ID: SR99-2044
Site Need Title: Demonstrate In-Situ Characterization Weight Percent Probe
Need Summary: An in-situ probe is needed to measure the time rate of change of percent solids in the SRS Extended Sludge Processing Tanks. In the sludge wash process it is necessary to allow sludge solids to settle to the bottom of waste tank prior to decanting the wash liquid. The purpose of the wt% probe is to determine when to begin the decant process, and at what elevation to insert the transfer jet intake. The wt% probe should be able to identify the sludge/supernate interface as that level above which the solids concentration is less that 0.1 wt%. To accomplish this function, the instrument must determine the wt % solids concentration at selected depths within the stored waste. At periodic intervals during the settling process the probe will be lowered to various elevations into the waste to

determine solids concentration. A sequence of such measurements over a period of weeks will allow a sludge/supernate interface level to be chosen that minimizes settling time.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99078, In-Tank Wt% Suspended Solids Probe and Slurry Monitors, TFA priority #24.

Site Need ID: SR99-2045
Site Need Title: In-Situ Waste Tank Corrosion Probe
Need Summary: A variable depth corrosion and corrosion species probe is needed to monitor the corrosion chemistry of SRS HLW tanks. It is desirable to have a probe instrument which will provide a readout of the corrosion rate, as well as the analytical content of the chemical species which affect corrosion in a HLW tank
Technical Disposition: The TFA responded to this need within the following technical response:

- 99043, High Level Waste Tank Corrosion Control and Monitoring, TFA priority #3.

Site Need ID: SR99-2051
Site Need Title: Technology to Mitigate Effects of Technetium Under Tank Closure Conditions
Need Summary: A better understanding of the chemistry of technetium is needed under the conditions of waste removal after tank closure. A better understanding would allow SRS to (1) more reliably characterize the inventory of Tc-99 in waste tanks in preparation for tank closure, and (2) reduce the conservatism of Tc-99 performance modeling in tanks closed with reducing grout.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99060, Sequestering of Radionuclide Contaminant Migration, TFA priority #36.
- 99088B, Leaching and Treatment of Tc for Tank Closure, TFA priority #25.

Site Need ID: SR99-3022
Site Need Title: In-situ Grouting and/or Retrieval of waste from Underground Tanks
Need Summary: Twenty-two inactive underground radioactive waste solvent storage tanks (Sl-S22) located in the Old Radioactive Waste Burial Ground (ORWBG) 643-E at SRS, are scheduled for closure under the FFA agreement. Due to the wide range of characteristics of the tanks and their contents, new technologies must be developed to treat the contents and reinforce their weakened structural integrity. An in-situ solidification and stabilization technology may be more suitable for closing some of the tanks with minimal contents. However, more sophisticated technologies, including at least some partial retrieval, may be necessary to remove the more complex organic wastes from some of the other tanks before closure in place.
Technical Disposition: The TFA responded to this need within the following technical responses:

- 99082, Horizontal and Small Tank Sludge Mixing and Mobilization, TFA priority #13.

- 99085, Demonstration of Grout Injection Technology for Tank Closure, TFA priority #10.

Site: WVDP

Site Need ID: OH-WV-902
Site Need Title: Decontamination of High-Level Waste (HLW) Canisters
Need Summary: The vitrification of HLW at WVDP has produced more than 240 canisters of HLW (with a limited number to be generated in the future) requiring disposal in a deep geologic repository. The canisters are currently stored in a shielded cell within the Main Process Building at the WVDP. Prior to transport off-site for continued interim storage or disposal, the outer surfaces of the canisters must be cleaned to remove radioactive contamination resuling from filling, and from storage in a contaminated environment. The decontamination process should produce a secondary waste stream that can be managed readily for packaging, storage, and disposal.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99072, Alternative DWPF Canister Decontamination Techniques, TFA priority #32.

Site Need ID: OH-WV-903
Site Need Title: Vitrification Expended Material Processing
Need Summary: A tooling system is needed to segregate, size reduce, decontaminate, and package metallic materials removed from the WVDP Vitrification Facility which are contaminated with HLW glass or slurry. The HLW removed from the materials would be returned to the operating melter, which itself has a finite life. The remaining metallic materials also need to be converted to a disposable form. The various tools must be deployable remotely for use in a highly radioactive environment.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99077, Demonstrate Remote Disassembly of HLW Melters and Other Processing Equipment, TFA priority #6.

Site Need ID: OH-WV-904
Site Need Title: High Level Waste Tank Closure
Need Summary: HLW tank closure options being considered for WVDP include tank removal and in-place stabilization. Technologies required for exhuming the tank may include remote decontamination equipment and dismantling equipment. Technologies required for tank stabilization closure plans may include grout mixing and delivery plans, performance assessments, and grout recipe selection.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99085, Demonstration of Grout Injection Technology for Tank Closure, TFA priority #10.

Site Need ID: OH-WV-905
Site Need Title: Retrieval of Tank Heels
Need Summary: A heel of residual waste solids will remain on the bottom of WVDP tanks 8D-1 and 8D-2 following bulk mixing of the liquid and solid wastes and subsequent transfers of the resulting slurry. Retrieval of these heels from tanks 8D-1 and 8D-2 may be required to meet tank closure requirements. A more effective and efficient waste retrieval system is needed which will mechanically retrieve and transport waste solids from the tanks.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99067, Tank Heel Retrieval Technology, TFA priority #4.

Site Need ID: OH-WV-906
Site Need Title: Radioactivity Measurement of High-Level Waste Tank Residuals
Need Summary: During the final phase of waste removal operations, the remaining radioactivity will need to be measured accurately to determine the appropriate clean-out technology required to reach final tank closure requirements. When most of the HLW and hazardous wastes are removed, the residual wastes remaining in the tanks will be in the form of sludge, diffused to corrosion products and adhered to tank internal support structures. Measuring both residual activity of the radioactive wastes and the remaining amount of hazardous waste material in the tanks are important to determine if tank endpoints have been met. Accurately measuring the remaining radioactivity levels of key radionuclides as set out in 10 CFR Part 61 and the amount of Hg, Cr, and other hazardous constituents is necessary. An investigation of advanced assessment technology and measurement methods is necessary.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99095, Radioactivity Measurement of High-Level Waste Tank Residuals; TFA priority to be determined by the TFA Management Team at a later date.

Site Need ID: OH-WV-907
Site Need Title: Leak Mitigation for High-Level Waste Tanks
Need Summary: During the final phase of waste removal operations at the WVDP, removal of sufficient radioactivity from tanks 8D-1 and 8D-2 will be required to reach established endpoint criteria. Mechanical removal methods will be used to achieve these criteria to the greatest extent practical. If additional radioactivity must be removed after mechanical removal methods have been exhausted, chemical removal methods may be used. Oxalic acid is the recommended chemical reagent. However, it is believed that if oxalic acid is used in the tanks, the tanks may develop a leak(s) due to the age and condition of the tanks. Therefore, if oxalic acid is used, a leak mitigation method is needed.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99057, Tank Leak Detection, Monitoring, and Mitigation, TFA priority #14.

Site Need ID: OH-WV-908
Site Need Title: Decontamination of High-Level Waste Contaminated Equipment

Need Summary: Methods are needed at WVDP to decontaminate equipment removed from tanks to Class C radioactivity levels during waste retrieval operations. Equipment could include items such as mobilization pumps, transfer pumps, and mechanical arms.
Technical Disposition: The TFA responded to this need within the following technical response:

- 99052, Technologies for Pit Operation Enhancement, Remote Operations/Maintenance, and Disassembly, TFA priority #22.

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