Pacific Northwest National Laboratory
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PNNL-14778

Establishment of a Cost-Effective and Robust Planning Basis for the Processing of M-91 Waste at the Hanford Site

W. L. Johnson
B. M. Parker

July 2004

Prepared for Fluor Hanford, Inc.

Sponsored by the U.S. Department of Energy
under Contract DE-AC06-76RL01830

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Pacific Northwest National Laboratory
Richland, Washington

Summary

The objective of this evaluation is to identify and evaluate viable alternatives for the accelerated processing of Hanford Site transuranic (TRU) and mixed low-level wastes (MLLW) that cannot be processed using existing site capabilities. Accelerated processing of these waste streams will lead to earlier reduction of risk and considerable life-cycle cost savings. The processing need is to handle both oversized MLLW and TRU containers as well as containers with surface contact dose rates greater than 200 mrem/hr (referred to as remote-handled [RH] waste). This capability is known as the "M-91" processing capability required by Tri-Party Agreement (TPA) milestone M-91-01. Figure S.1 provides a conceptual view of the binning of M-91 wastes into functional categories that can then be processed in an accelerated manner.

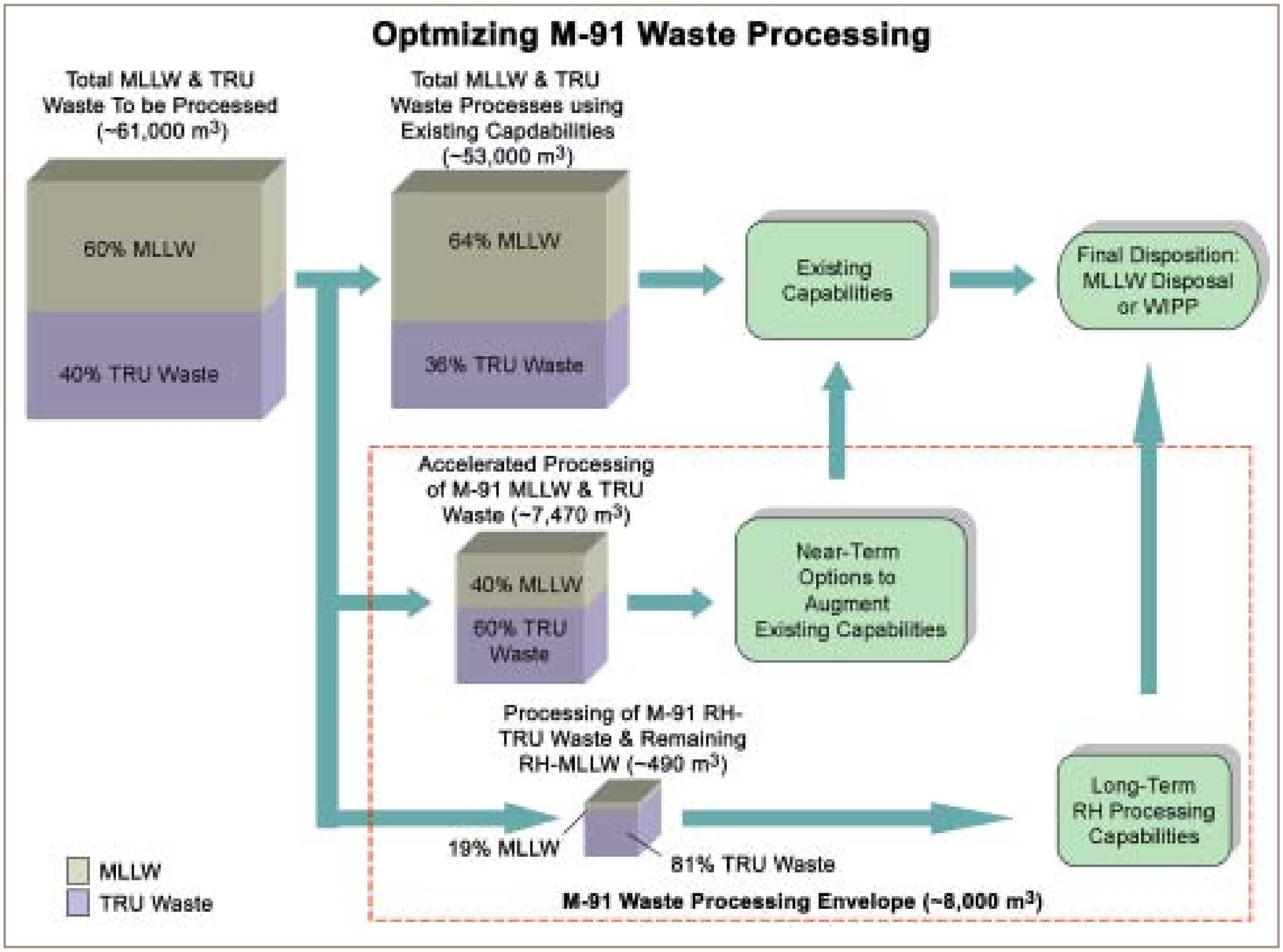

Figure S.1. M-91 Waste Conceptual Processing Flow Diagram

In developing a preferred M-91 processing approach and associated path forward, the following guiding programmatic goals and principles were employed:

- Select options that accelerate processing of waste in storage (early reduction of, or avoidance of, waste backlog).
- Maximize the use of existing onsite capabilities, commercial capabilities, or limited capability upgrades to reduce the capital cost and schedule impacts associated with new processing facilities or modules.

- Continue to gain experience and practical knowledge in the repackaging and processing of contact-handled (CH) waste prior to embarking on the processing of the more difficult and hazardous RH waste streams.
- Ensure all capabilities needed are in place for the processing of the M-91 waste (no identified gaps) and that there is flexibility (backup capability and potential for expansion) where possible.
- Optimize the use of recommended facilities/capabilities to avoid operational impacts (e.g., cycling of resource needs due to high variations in processing rates and requirements) and the associated cost inefficiencies.
- Select options that accelerate completion of the overall processing program and enable the earliest possible shutdown of individual facilities/capabilities.

Based on the results of this evaluation, a number of recommendations are made in an effort to accelerate processing, maintain a degree of flexibility and redundancy in processing capabilities (to respond to potential future changes in the waste generation, processing requirements, or expected volumes), and enable early start and completion of the processing mission. Table S.1 summarizes the current M-91 waste stream projections along with the recommended path forward for processing these wastes.

Table S.1. M-91 Waste Stream Forecasts and Preferred Alternative Processing Approach and Assumptions

Waste Categories		M-91 Waste Volumes (m^3)				M-91 Processing Options			
		Stored	TRU Waste Retrieval Program	Fore-cast	Total	Augment Existing Capabilities to Accelerate Near-Term Processing		RH Waste Processing Capability	
CH	Oversized MLLW	311	2,614	0	2,925	Commercial Treatment	10%	NA	NA
						In-Trench Treatment	40%		
						Repackaging Facilitiy(s)/Modules	50%		
	Oversized TRU(M)	751	3,501	199	4,451	Repackaging Facility(s)	100%	NA	NA
RH	MLLW	27	153	6	186	Commercial Treatment	10%	Shielded (RH) Processing Capability	50%
						In-Trench Treatment	40%		
	TRU	50	79	270	399	NA	NA	Shielded (RH) Processing Capability	100%
Total		1,139	6,347	475	7,961				

The new, phased approach proposed in this evaluation would use a combination of existing and planned processing capabilities to treat the more easily managed CH waste streams first and would provide for earlier processing of these wastes. This proposed approach would not only accelerate initiation of the processing of the M-91 waste streams, but would significantly complete the processing mission ahead of the previous baseline and the TPA-mandated processing rates and schedules by nearly a decade. As a result of the early retirement of the T Plant facility due to accelerated processing of M-91 waste (including the expanded use of offsite and in-trench treatment), an estimated life-cycle savings of nearly $125 million is predicted. The following specific actions are recommended to achieve this level of potential savings:

- Continue efforts to reduce the volume of waste that needs processing by an M-91 capability, including supporting Treatment-by-Generator processing and encouraging retrieval operations to package waste in standard-size containers if possible. Work with tank farm operations and closure contractor(s) to determine if alternative capabilities can be provided for the waste generated after 2019.
- Expand existing commercial MLLW treatment contracts to accept larger and higher-dose-rate packages.
- Work with the regulators to allow in-trench treatment for a portion of the oversized and RH MLLW.
- Conduct an engineering study in FY05 to define the size reduction and repackaging capabilities needed to accelerate the processing of the oversized CH-MLLW and CH-TRU waste in storage and expected to be generated by the TRU Retrieval Program. Options including modification of existing facilities, use of modules within or adjacent to existing facilities, and use of temporary containment enclosures should be considered. Acquire this capability in FY06 to allow processing to commence in FY07, allowing all stored, generated, or retrieved CH M-91 wastes to be processed by 2012.
- Beginning in FY06, initiate the solicitation process, through a request for interest, to ascertain the viability of implementing a commercial processing capability for the RH-TRU and remaining RH-MLLW.
- Conduct an engineering study in FY06/07 (in conjunction with the release of the WIPP RH-TRU WAC) to define the RH waste processing and treatment capabilities needed to complete the M-91 processing mission.
- Based on the solicitation process and the engineering study, a decision point will occur in late 2007 (in conjunction with TPA Milestone M-91-05-T01) to determine the preferred RH processing approach. This capability will then be acquired (FY08–FY11), allowing limited processing to commence in FY12 and potentially earlier.
- Optimize T Plant facility upgrades and operational missions to continue to reduce the volume of back-logged waste, and provide continuity of waste processing missions and expertise.

The M-91 Processing Path Forward Timeline is provided in Section 6.0 of this report and is illustrated in an overall M-91 Waste Inventory “work-off” diagram (Figure S.2). Modest near-term annual investments of ~$1.5M in FY05/FY06 and ~$8M in FY07–FY10 are needed to realize the maximum benefit of the new, phased processing approach.

This proposed approach would not only accelerate initiation of the processing of the M-91 waste streams, but would significantly complete the processing mission ahead of the previous baseline and the TPA-mandated processing rates and schedules by nearly a decade.

An estimated life-cycle savings of nearly $125 million is predicted.

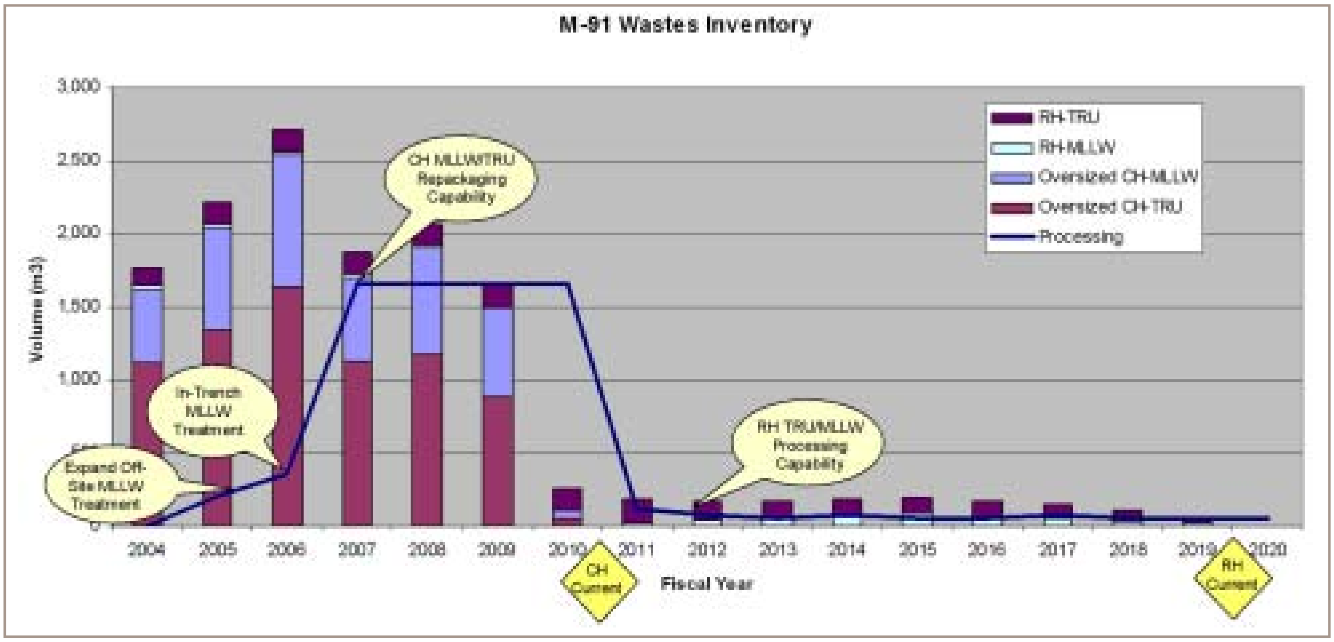

Figure S.2. Accelerated Processing of M-91 Waste

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Acronyms

APL	accelerated process line
CH	contact-handled
CWC	Central Waste Complex
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
ERDA	U.S. Energy Research and Development Administration
ES	engineering study
FDC	Functional Design Criteria
FHI	Fluor Hanford, Inc.
FMEF	Fuel & Materials Examination Facility
FY	fiscal year
HSSWAC	Hanford Site Solid Waste Acceptance Criteria
HSWEIS	Hanford Solid Waste Environmental Impact Statement
LDR	Land Disposal Restriction
LLBG	Low Level Burial Ground
LLCE	long-length contaminated equipment
MASF	Materials and Storage Facility
MLLW	mixed low-level waste
NDA	non-destructive assay
NDE	non-destructive examination
ORP	(U.S. Department of Energy) Office of River Protection
PNNL	Pacific Northwest National Laboratory
PUREX	Plutonium-Uranium Extraction Facility
RH	remote-handled
RL	U.S. Department of Energy, Richland Operations Office
ROD	Record of Decision
SWIFT	Solid Waste Integrated Forecast Technical (database)
SWB	standard waste box
TPA	Tri-Party Agreement (Hanford Federal Facility Agreement and Consent Order)
TRU	transuranic
WAC	Waste Acceptance Criteria
WIPP	Waste Isolation Pilot Plant
WRAP	Waste Receiving and Processing Facility

1.0 Introduction

1.1 Objective and Scope

The objective of this evaluation is to identify and evaluate viable alternatives for the accelerated processing of Hanford Site transuranic (TRU) and mixed low-level wastes (MLLW) that cannot be processed using existing capabilities. The limited existing processing capabilities include:

- The use of both offsite contracts and onsite facilities for treating MLLW prior to compliant disposal onsite, covering ~93% of the predicted MLLW volumes.
- The use of the Waste Receiving and Processing Facility (WRAP), the T Plant Complex, and mobile TRU waste processing units for the processing and certification of the TRU waste prior to shipment to the Waste Isolation Pilot Plant (WIPP) for disposal, covering ~78% of the predicted TRU Waste Volumes.

The processing need is to handle both oversized MLLW and TRU containers as well as containers with surface contact dose rates greater than 200 mrem/hr (referred to as remote handled [RH] waste). This capability is known as the "M-91" processing capability required by Tri-Party Agreement (TPA) milestone M-91-01. Thus the waste to be processed is referred to as "M-91" waste. Over time, the forecasted amount of M-91 waste has been changing and is trending downward. An updated analysis of the waste volumes requiring such processing is provided in Section 3.0. It is this change, along with changes in existing capabilities and a driving desire to accelerate Hanford's cleanup and waste processing tasks, that has led to the need to reexamine the M-91 waste processing plans.

The objective of this evaluation is to identify and evaluate viable alternatives for the accelerated processing of Hanford Site transuranic (TRU) and mixed low-level wastes (MLLW) that cannot be processed using existing capabilities.

In performing the evaluation of the processing alternatives, the following guiding programmatic goals and principles were employed:

- Select options that accelerate processing of waste in storage (early reduction of, or avoidance of, waste backlog).
- Expand the use of existing onsite capabilities, commercial capabilities, or limited capability upgrades to reduce the capital cost and schedule impacts associated with new processing facilities or modules.
- Continue to gain experience and practical knowledge in the repackaging and processing of contact-handled (CH) waste prior to embarking on the processing of the more difficult and hazardous RH waste streams. This allows progress to be made while solving the more difficult problems associated with the high dose rate waste.
- Ensure all capabilities needed are identified and planned for the processing of the M-91 waste (no identified gaps) and that there is flexibility (backup capability) where possible.
- Optimize the use of recommended facilities/capabilities to avoid workforce impacts (e.g., cycling of resource needs due to high variations in processing rates and requirements) and the associated cost inefficiencies.
- Select options that accelerate completion of the overall processing program and enable the earliest possible shutdown of individual facilities/capabilities.

The aim of this evaluation is to develop a preferred M-91 processing approach and associated path forward to provide a basis for program planning and needed follow-on engineering evaluations.

1.2 Background

As the programs that generate or process waste have matured, waste volume forecasts from these programs have been updated to reflect this understanding. These changes are consistent with Hanford's life-cycle baseline planning assumptions (DOE 2002). During the past few years waste volume projections requiring M-91 capabilities have significantly decreased.[(a)] While it is difficult to directly compare previous forecast details, Figure 1 illustrates the dramatic changes that have occurred over the past decade. Some of the reasons for these changes are:

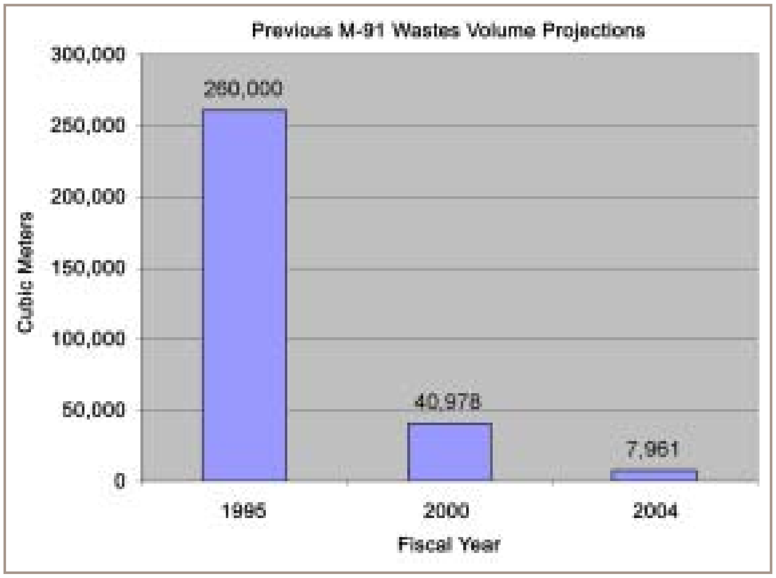

Figure 1. Historic M-91 Waste Projections

- Changes to the Waste Acceptance Criteria (WAC) requiring forecasted wastes to be packaged consistent with treatment capabilities. This change was driven by Hanford's Solid Waste Program as a means to minimize generation of problematic waste streams.
- Treatment and processing capabilities have expanded.
- Generators will be sending MLLW directly to commercial treatment units or treating MLLW at the point of generation, thus reducing the amount of newly generated waste requiring "M-91" processing.
- Generators have also been aggressively implementing waste minimization and pollution prevention programs aimed at further reducing waste volumes from routine operations and ensuring that wastes produced are packaged in a size and manner to allow direct disposition.
- Tank farm closure activities are producing MLLW that had been previously forecast as TRU waste.
- The Plutonium Finishing Plant has made advancements in its planning for glove box decontamination and decommissioning (D&D) and waste packaging that have reduced the forecasted amount of TRU waste generation.
- All post-1970 retrievably stored suspect TRU waste must be retrieved, and all non-TRU waste is now assumed to be MLLW and will be segregated and treated to meet applicable federal and state land disposal restriction (LDR) standards. This has lead to an increase in M-91 MLLW volume.

During the past few years waste volume projections requiring M-91 capabilities have significantly decreased.

These changes and changes in the M-91 milestones, have allowed processing alternatives that address specific wastes to become more attractive as compared with pursuing a single facility capable of handling all RH and large-container waste. Previous studies that evaluated processing alternatives include the *Solid Waste and Materials Systems Alternatives Study* (WHC 1995) and the *Trade Study for the Processing*,

(a) Waste volume projections are described in greater detail in Section 3.0. Historic waste volume projections were obtained from previous studies. Current waste volume projections are obtained from the Solid Waste Integrated Forecast Technical (SWIFT) database, current as of December 2003 and inventory records.

Treatment, and Storage of Hanford Site Solid Waste Streams That Have No Current Path Forward (WMFS 1998). These studies, along with Site Schedule Options Studies conducted in FY01, indicated use of an existing permitted facility (T Plant Complex) would be significantly less expensive than the design, construction, startup, and D&D of a new facility (capital cost of approximately $100M for upgrading the existing facility versus $350M for a new facility).

Other examples of programmatic and technical progress that influence the evaluation include:

- New M-91 change package milestones accelerate the requirements for some M-91 capabilities.
- Hanford has worked with commercial treatment services to expand commercial processing capabilities to augment the strategy for Hanford Site MLLW. Prior to this effort, there was limited offsite capability for RH MLLW or CH MLLW in packages larger than 5 ft x 5 ft x 9 ft. Offsite capability is currently being evaluated for some RH MLLW, perhaps up to 500 mrem/hr and up to 10 m^3 for larger packages.
- The 233-S Building was contaminated with plutonium, but was demolished using aggressive contamination control measures (Figure 2). This experience suggests that some large packages of material might be processed in temporary enclosures at the point of generation with similar aggressive contamination control measures. In addition, experience with temporary enclosures at the 222-S facility could also be applied in conjunction with existing processing facilities to provide an economical solution for the processing of the largest waste packages.

Figure 2. 233-S D&D Operations

It should be noted that a potentially significant volume of waste may be generated as a result of implementation of future cleanup decisions, where formal records of decision (RODs) have not yet been reached. Such potential waste volumes are not included in current forecasts, and include sources such as the PUREX Tunnels, the Pre-1970 LLW burial grounds, extensive D&D of canyons and other 200 Area facilities, and various tank closure options. In addition, the risk-based end state processes currently under way could also drastically alter the timing and makeup of waste volumes requiring M-91 processing capabilities.

It is for these reasons a flexible planning basis is needed to ensure that capabilities can be adapted as program changes are encountered. Most of the remedial decisions that will influence such changes will be made over the next four years. Impacts from these decisions could significantly alter the M-91 forecasts, resulting in potential order of magnitude changes. TPA Milestones M-016-93 (Ecology 2004) requires submission of an implementation workplan by September 30, 2006 to reflect cleanup decisions and the resulting projected waste volumes. This plan will be updated in FY09 and FY12.

A potentially significant volume of waste may be generated as a result of implementation of future Hanford cleanup decisions.

2.0 Methodology

In order to meet the objectives of this evaluation, a simple, step-wise process was developed. This process is illustrated in Figure 3 and is aimed at understanding the sources and characteristics of the waste requiring treatment or processing and the identification and evaluation of a suite of viable alternatives. This report is not intended to replace the follow-on engineering studies that are needed to formally establish design criteria and cost estimates, but merely to aid in focusing the content of those studies on the most desirable options.

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The first two steps of the process are to identify, describe and bin the waste steams requiring processing into manageable sub-groups. This is necessary to fully understand what is and what is not included in the M-91 waste streams, and which streams dominate the profile and when they are produced. Second, existing capabilities that can be applied to portions of these waste volumes will be described and accounted for. The results of these first two steps will be waste volume forecasts and necessary capabilities (by function) that need to be advanced on to the subsequent evaluation phases. This portion of the evaluation defines the scope of the subsequent analyses and is included in Section 3.0.

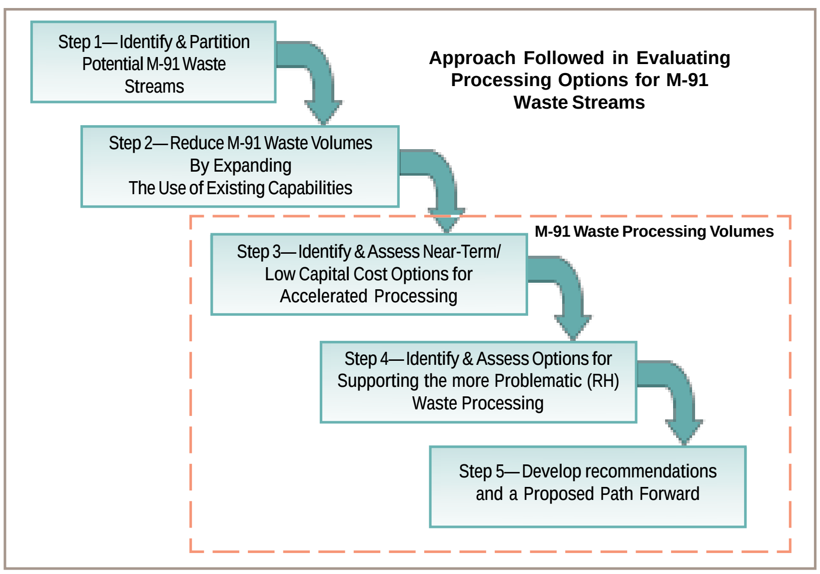

Figure 3. Evaluation Methodology

The evaluation of alternative processing options for the identified M-91 waste volumes will be conducted in the next two steps of the evaluation process. The third step of the evaluation process will be to identify processing and treatment options that maximize the use of existing capabilities and contracts, require minimal capital investments, and are aimed at accelerating the processing of wastes currently in inventory. This phase will be predominately aimed at the oversized contact handled (CH) MLLW and TRU waste with only a small fraction of the more problematic RH waste being addressed. Alternatives will be described and evaluated. The evaluation will consider the advantages and disadvantages for each alternative, using the following attributes as discriminators:

- Cost Implications.
- Schedules Constraints.
- Worker Health & Safety.
- Regulatory Acceptability.

Alternatives deemed non-viable will be dismissed from further consideration. Much of the information used in this evaluation will be from previous engineering studies and may be qualitative or semi-quantitative in nature.

The fourth step in the evaluation process begins with the description of the waste volumes that cannot be addressed using existing or augmented capabilities and require fundamentally new processing options. The possible suite of facility alternatives that could support those remaining capability needs will be identified and evaluated using the same approach and evaluation criteria as described above. Both the third and fourth step of the evaluation process are described in Section 4.0.

The final step in the evaluation process will be the development of recommendations and a path forward to provide a basis for program planning and needed follow-on engineering evaluations. Section 5.0 contains a comparison of the recommended strategies to the existing baseline. Based on these conclusions, Section 6.0 provides recommendations for proceeding with the implementation of a new, phased processing approach.

The final step in the evaluation process will be the development of recommendations and a path forward to provide a basis for program planning and needed follow-on engineering evaluations.

3.0 Existing Capabilities and M-91 Waste Estimates

This section provides a description of existing capabilities for the treatment and disposal of MLLW and for the processing, certification, and disposition of TRU waste. Predicted waste volumes and their generation/retrieval over time are provided for those waste streams that cannot be processed using existing capabilities. These waste volume estimates form the basis for the M-91 capability needs. This section also contains a brief description of the uncertainties associated with these waste volume estimates, as well as a description, by function, of the capabilities needed to store, process/treat, and disposition the M-91 waste volumes.

3.1 Existing Capabilities

Figure 4 provides a summary of the existing capabilities for the storage, treatment, and processing of MLLW and TRU waste and illustrates the resulting M-91 waste volumes.

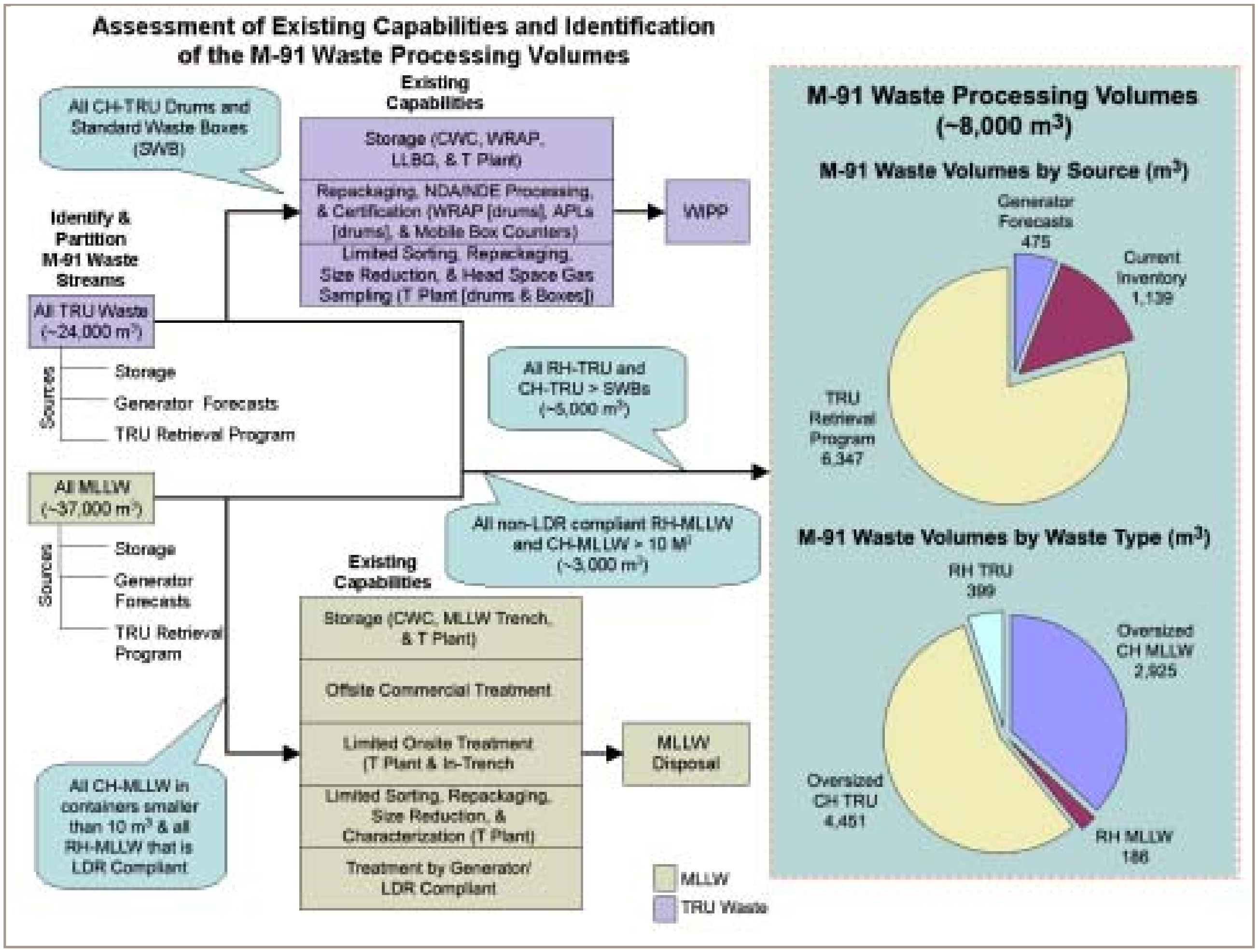

Figure 4. Determination of M-91 Waste Volumes

3.1.1 Existing TRU Storage/Processing Capabilities

TRU waste is currently stored within the Central Waste Complex (CWC), at the WRAP facility, within the Low Level Burial Grounds (LLBG) (retrievably stored), and at the T Plant canyon. Figure 5 provides a number of photographs of Hanford's waste storage operations.

Figure 5. Hanford's Primary TRU and MLLW Storage Facilities

Figure 6. Hanford's WRAP Facility

Processing of drums of TRU waste (includes nondestructive assay (NDA)/nondestructive examination (NDE), head space gas sampling, repackaging, verification, certification, and load-out) is performed at the WRAP facility (Figure 6). Similar operations were also performed using mobile TRU waste processing units (e.g., Accelerated Processing Lines (APLs) or other transportable assay devices). Use of mobile units will be expanded in FY05 to include the capability to handle standard waste boxes (SWBs) with the addition of two new box counters. Mobile units will be used for all newly generated CH-TRU drums and SWBs after WRAP is shut down in 2012.

In addition to the storage of remote-handled TRU and MLLW, T Plant Complex (Figure 7) is also currently used on a limited basis to support waste sampling and characterization, repackaging, and segregation of RH and CH TRU wastes. In addition, the 2706-T facility is used to augment WRAP and the APLs by conducting head space gas sampling activities. Appendix A provides additional details surrounding the T Plant Complex's current capabilities and uses.

Figure 7. Hanford's T Plant

3.1.2 Existing MLLW Storage/Treatment Capabilities

MLLW, like TRU waste, is primarily stored within Hanford's CWC facility (Figure 5). In addition, RH MLLW is also stored at the T Plant Canyon. The treatment of MLLW is primarily accomplished through a series of offsite commercial contracts (e.g., PEcoS, PermaFix). In general, these contracts were set up to handle contact-handled waste for drums and boxes smaller than 6 cubic meters (5 ft x 5 ft x 9 ft box). However, they have been used on a case-by-case basis to deal with larger containers up to 14 cubic meters. Contract modifications are currently being pursued to allow for the routine shipment of waste in containers up to 10 cubic meters (6 ft x 6 ft x 10 ft box).

Figure 8. Macroencapsulation of MLLW

On a limited basis, onsite treatment (primarily macroencapsulation) is conducted. In addition to treatment by generator, treatment has also been performed at the T Plant Complex. As an example, long-length contaminated equipment (LLCE), which consists of equipment more than 12 feet long that is removed from underground waste tanks (e.g., mixer pumps, transfer pumps, air lances, and monitoring equipment), is being macroencapsulated and disposed into one of Hanford's MLLW Disposal Units (LLBG 218-W5 T31/T34). The macroencapsulation of LLCE began in CY 1996 and was originally performed at the T Plant Complex. Since then, treatment has been done under the Treatment-by-Generator provisions and shipped directly to the disposal unit (Figure 8). Such treatment is also performed on a limited basis within Hanford's disposal trenches. For example, MLLW is treated within the boundaries of the Environmental Restoration Disposal Facility, and Greater than Category 3 Low Level Waste is treated in a similar manner within the LLBGs.

The T Plant Complex is also used to sort, characterize, size reduce, and repackage MLLW. Such operations allow for the waste to be placed in standard container sizes that can be shipped to the offsite commercial treatment providers. Operations such as these are typically required to be performed at the T Plant Complex in cases where there is unknown or questionable inventory or items present in the waste that commercial treatment providers cannot accept.

3.2 Predicted Waste Volumes

Waste that cannot be currently treated/processed using the existing Hanford Site capabilities described above will form the basis for the M-91 waste processing volumes. Appendix B contains the output from the SWIFT database for all RH MLLW and TRU waste as well as for oversized MLLW (in containers greater than 10 m^3) and oversized TRU waste (in containers larger than an SWB). The projected waste volumes, over time, are provided in Figure 9. Table 1 groups the predicted waste volumes into three primary sources: generator forecasts, current inventory, and waste associated with the TRU Retrieval Program.

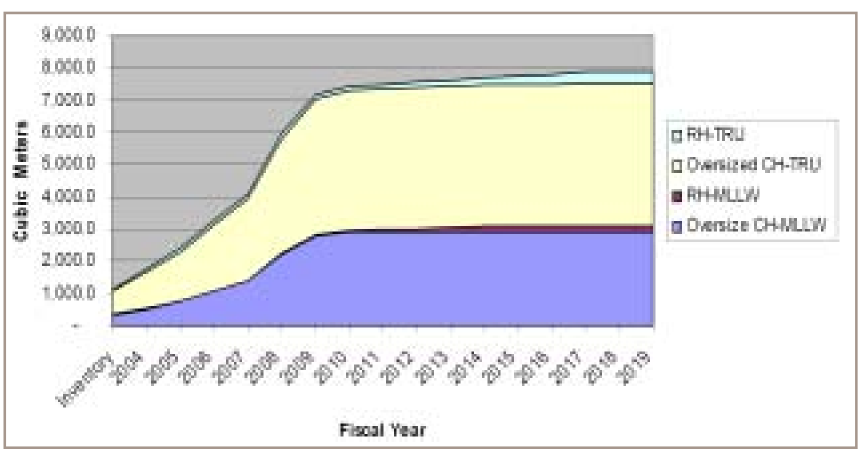

Figure 9. M-91 Waste Volume Generation

Table 1. M-91 Waste Process Volumes (m^3)

	Oversized CH-MLLW	RH-MLLW	Oversized CH-TRU	RH-TRU	Total
Generator Forecasts	0	6	199	270	475
Current Inventory	311	27	751	50	1,139
TRU Retrieval Program	2,614	153	3,501	79	6,347
Total	2,925	186	4,451	399	7,961

From the forecast data, a number of relevant conclusions can be drawn. The bulk of the M-91 waste that requires processing is the oversized contact-handled TRU waste and oversized contact-handled MLLW, which combined represents over 90% of the total volume to be processed with a significant amount already in inventory/storage (over 1,000 cubic meters). The predominant source of the M-91 waste is the TRU Retrieval Program (Figure 10) with nearly 80% of the volume. Oversized and RH waste coming out of the TRU Retrieval Program may require processing before a determination can be made on whether the waste is MLLW or TRU waste. Cargo containers as large as 40-ft long are included within this program and represent some of the largest containers that will require processing. In cases where existing containers (such as wooden and fiberglass reinforced boxes or aging drums) have become breached or unstable, efforts will be made, to repackage the material in the trench into more standard size containers to facilitate the downstream treatment/processing.

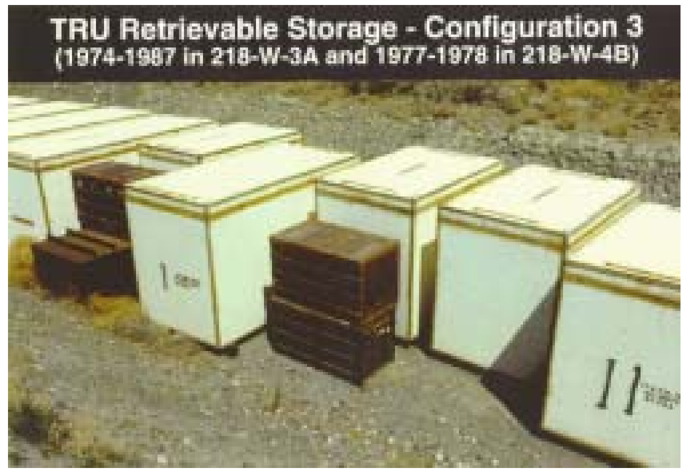

Figure 10. Retrievable Storage of TRU Waste

Figure 11 illustrates the relative contribution to the M-91 waste volumes from these primary sources and by waste type. Appendix B also provides a number of graphs summarizing the predicted waste volumes over time. The TRU Retrieval Program is currently scheduled to complete retrieval operations for CH-TRU by 2010, for boxes and drums of RH-TRU by 2015, and of the RH-TRU stored in under-

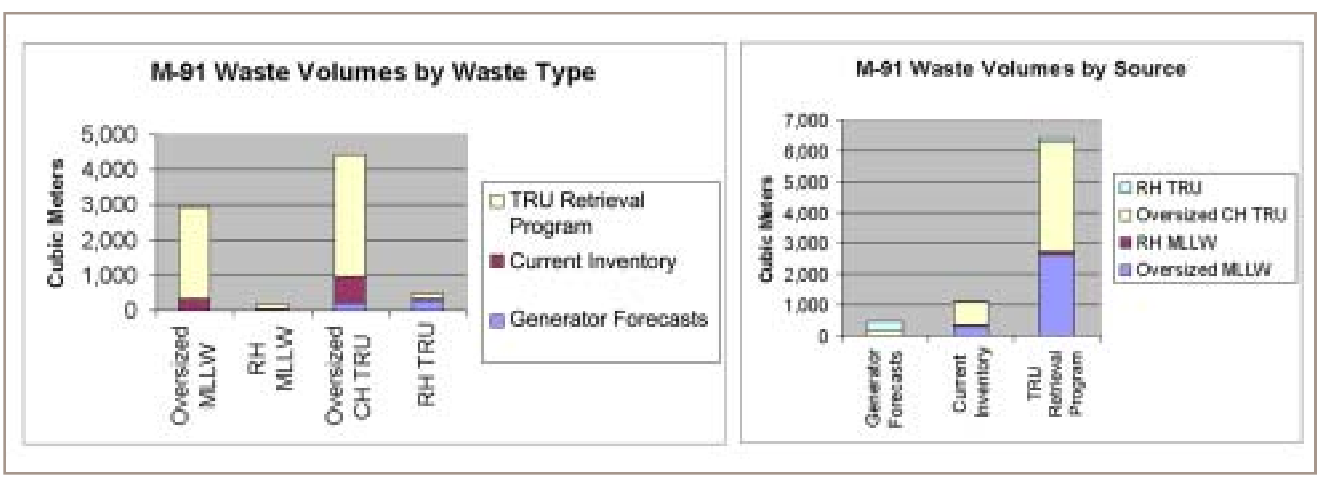

Figure 11. M-91 Waste Volume Projections

ground caissons by 2018. The next largest contributor to out-year waste forecasts is the RH-TRU waste projected to come from the 618-10/11 burial ground remediation, which is scheduled to begin in 2013 and be completed by 2017. Very little M-91 MLLW is included in the generator forecasts. M-91 TRU waste volume projections beyond 2017 are relatively small and are all associated with the Office of River Protection (ORP) tank closure activities.

In general, the trend in waste volumes has been downward with current estimates considerably lower than previous estimates.

Other radioactive wastes and materials, including K-Basin sludge, routine LLW, liquid wastes, cesium and strontium capsules, plutonium materials, spent nuclear fuel, environmental restoration wastes (except the predicted TRU waste coming from the 618-10/11 burial ground remediation), and tank waste are outside the scope of this evaluation and are not expected to be processed or treated using the M-91 capabilities.

3.3 Uncertainties

Figure 12 illustrates recent changes in waste volume projections over the past few years. In general, the trend has been downward with current estimates considerably lower than previous estimates. In 2000 (and earlier) the waste forecast did not identify MLLW that was LDR-compliant, thus the forecast in 2000 included all oversized CH and all RH MLLW forecast (whether ready for immediate disposal or requiring treatment). In addition, long-length equipment from the high-level waste tanks is no longer included in the forecast since it is assumed that these items will either undergo treatment-by-generator or will be closed in place.

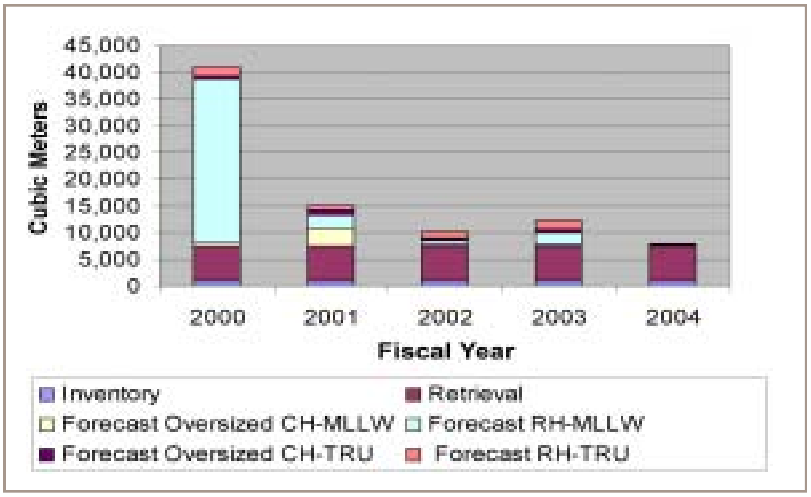

Figure 12. Recent Changes in Waste Volume Projections

However, as was previously noted, a potentially significant volume of waste may be generated as a result of implementation of future cleanup decisions. Such potential waste volumes are not included in current forecasts, and include sources such as the PUREX Tunnels, the Pre-1970 LLW burial grounds, extensive D&D of Canyons and other 200 Area facilities, and various tank closure options. Recently established TPA Milestone M-016-93 requires DOE to submit an implementing workplan in September 2006 to EPA for the acquisition of capabilities necessary to prepare TRU and TRUM waste generated by CERCLA cleanup actions for shipment to WIPP (Ecology 2004). In addition, the risk-based end state processes currently underway could also drastically alter the timing and makeup of waste volumes requiring M-91 processing capabilities. Other potential factors influencing these forecasts include the ability of generators to accurately forecast their predicted waste streams, along with their ability to treat to LDR standards and package into containers suitable for processing with existing facilities.

3.4 Waste Disposition Capabilities Required

The following subsections describe the individual capabilities or functions that are needed to allow for the final disposition of the M-91 waste streams. Some of these functions will be used in conjunction with existing capabilities. Following the description of the needed capabilities, a summary of the existing technical baseline and the M-91 settlement agreement is provided.

3.4.1 Waste Disposition Functional Requirements

M-91 capabilities that will need to be provided for oversized CH-TRU include:

- Sorting/repackaging
- Size reduction
- Solidification/neutralization
- Visual verification

Once the waste is verified and repackaged into drums or SWBs, the remaining NDE/NDA and certification steps can be completed by the WRAP facility or the mobile processing units.

M-91 capabilities that will need to be provided for RH-TRU include all the capabilities listed above for the oversized CH-TRU along with the following:

- NDA/NDE
- Head Space Gas Sampling[(a)]
- Certification/Load-out

All TRU waste will be disposed at the WIPP, near Carlsbad, New Mexico. Certification to the requirements of the WIPP waste acceptance criteria (WAC) is required prior to shipping the waste. The RH-TRU WAC have not yet been established. It is expected that these criteria will not be issued until calendar year 2005/2006. At this time, the only approved shipping casks for RH-TRU waste is the RH-72-B cask, which is currently limited to three 55-gallon drums.

The current baseline includes modification of an existing facility (221-T Canyon), and/or the use of modular process systems within that facility, to provide a broad suite of processing capabilities for CH and RH TRU waste and MLLW.

MLLW will be treated to meet land disposal restrictions (LDR). M-91 capabilities that will need to be provided for MLLW include:

- Sorting/repackaging
- Size reduction
- Decontamination/neutralization
- Stabilization
- Macro-encapsulation

In some cases, all that will be necessary will be sorting and repackaging the waste into containers that can be sent offsite for treatment. This approach will be required for the fraction of MLLW that cannot be treated using macro-encapsulation and requires thermal or other alternative treatment method.

3.4.2 Current Technical Baseline

The current baseline includes modification of an existing facility (221-T Canyon), and/or the use of modular process systems within that facility, to provide a broad suite of processing capabilities for CH and RH-TRU waste and MLLW. Under this baseline, full capabilities were originally scheduled to begin no earlier than FY08

(a) As determined to be necessary by the WIPP RH-TRU WAC.

for MLLW and FY13 for TRU waste and continue through FY32. This processing option is included as the preferred alternative in the recently approved Final Hanford Site Solid Waste Environmental Impact Statement (DOE 2004).

However, the recent M-91 settlement agreement (see Ecology 2004) has accelerated this schedule. The minimum schedule for obtaining M-91 capabilities is specified by the M-91 agreement. M-91-01 requires all of these facilities/capabilities to be in place by 6/30/12. M-91-05-T01 requires the Engineering Study/Functional Design Criteria Study for these facilities/capabilities to be completed by 12/31/07. This timeframe is intended to allow time for the WIPP WAC RH criteria to be established for use in these studies. In addition, initiation of treatment of RH and large-size MLLW is required by 6/30/08 at a rate of 300 m^3 per year. Initiation of treatment of RH and large-size TRU waste is required by 6/30/12, at a rate of 300 m^3 per year. Using the waste volumes estimated and the required TPA initiation dates and minimum processing rates (e.g., 300 m^3 per year) will result in the treatment of all generated and stored MLLW (i.e., no inventory remaining) by 2018 and TRU waste by 2028 (Figure 13).

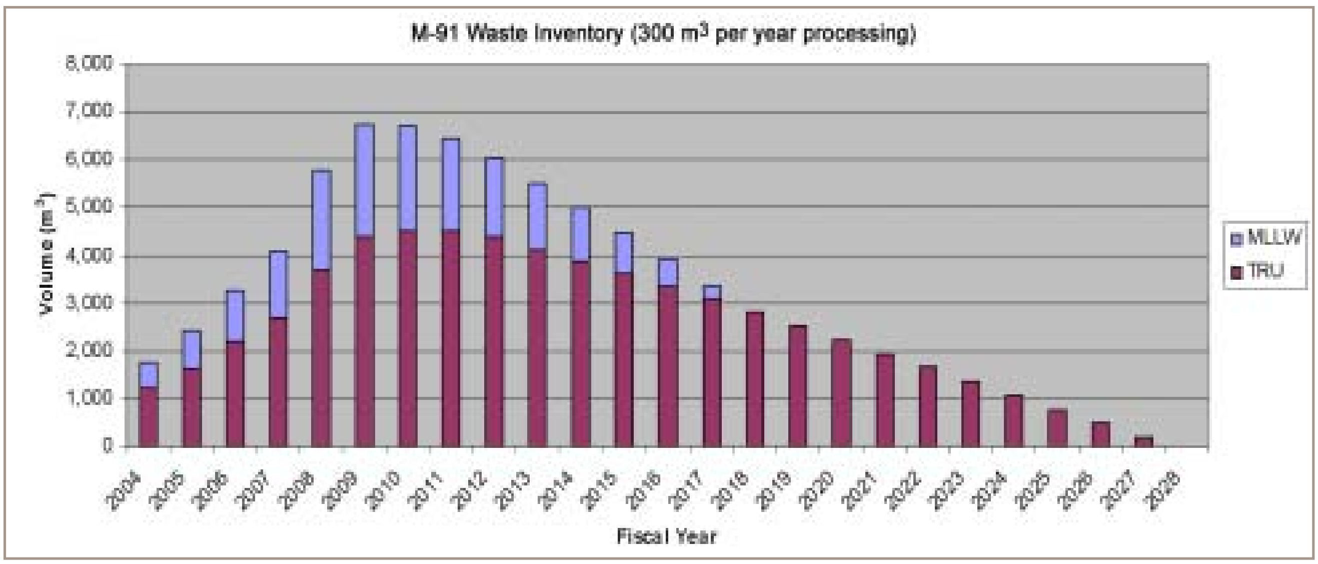

Figure 13. M-91 Waste Inventory Using the Minimum TPA Processing Rates

4.0 Alternative Descriptions

A two-step process is envisioned for acquiring and utilizing the needed M-91 capabilities. The objective of this process will be to "work-off" the backlog (including the waste in storage and being generated) of CH waste in the next 5 to 6 years, while gaining valuable experience and preparing the way for the more difficult RH waste streams. The first step will be to rapidly obtain the necessary agreements, contracts, and in-house capabilities needed to address the large volume of oversized CH-MLLW and CH-TRU waste currently in inventory and being generated during the TRU Retrieval Program. The capabilities arising from this step will be a natural extension and augmentation of existing capabilities and will, in fact, be coupled with the ongoing processing of wastes at WRAP and/or the mobile TRU processing units and with the existing MLLW treatment providers.

The second step will be to evaluate the processing options for the RH waste streams and other problematic wastes that cannot be processed/treated through the actions described above. The RH-TRU waste will drive the processing requirements for this step, which cannot be fully developed until WIPP has finalized its RH-TRU WAC. Once the criteria are in place, the objective of this step will be to select the most cost-efficient and timely processing approaches to complete the processing of the RH waste in an accelerated fashion to allow for the early closure of the processing facility(s). Figure 14 illustrates this process and Table 2 provides a summary of the alternatives considered.

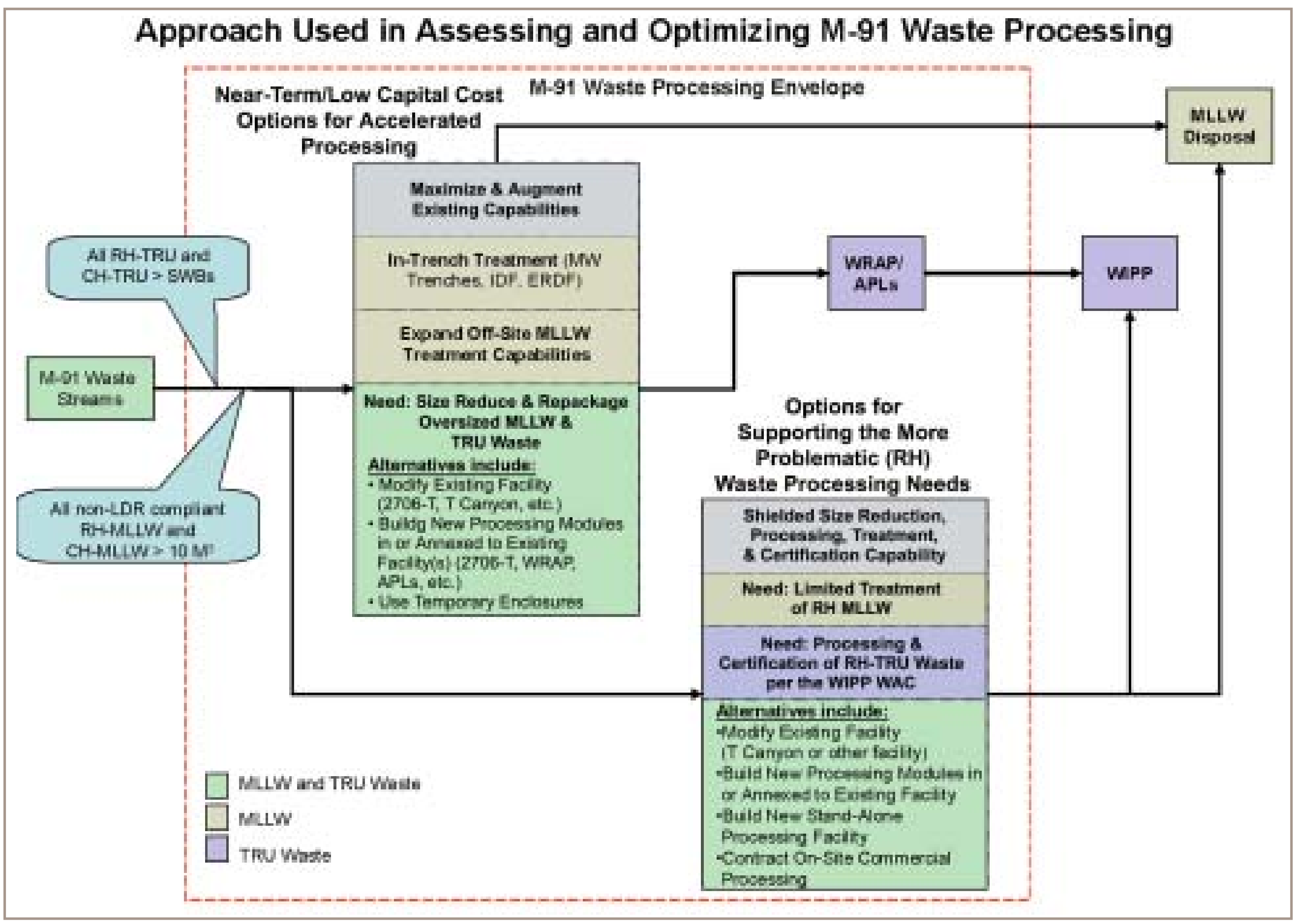

Figure 14. M-91 Processing Evaluation Approach

Table 2. Alternatives Evaluated

Alternatives		Waste Streams			
Primary	**Sub-alternatives / Options**	**MLLW**		**TRU Waste**	
		Oversized	**RH**	**Oversized**	**RH**
In-Trench Treatment of MLLW	NA	✔	✔		
Expand Offsite Treatment Contracts	NA	✔	✔		
CH Repackaging / Size Reduction Capability	Modification of Existing Facility(s) - T Plant Canyon and 2706-T Use of New Processing Modules Use of Temporary Containment Enclosures	✔		✔	
RH Processing / Treatment Capability	Modification of Existing Facility - T Plant Canyon * Modification of Other Existing Facility(s) – FMEA, MASF, & WNP #1 Use of New Processing Modules * New Onsite Facility – Line Item Acquisition of Onsite Commercial Capability		✔		✔

* Sub-alternatives deemed to be non-viable due to cost and schedule constraints and suitability to the limited processing mission.

The following subsections provide a summary of the alternatives evaluated. Only those alternatives deemed viable are included in the summary discussion below. Appendix C provides additional details used in the evaluation process, including a brief description of those alternatives deemed to be non-viable. Appendix D provides a listing of the key assumptions that were used in developing the scope and applicability of each alternative to the relevant M-91 processing waste stream(s) and volume(s). These assumptions were developed in conjunction with FH subject matter experts and are useful in establishing a basis for understanding potential processing rates and costs as well as providing a "starting point" for the follow-on engineering evaluations.

4.1 Augment Existing Capabilities to Accelerate Near-Term Processing

In order to implement the recommendation to process the more easily managed CH and low dose RH waste first, several activities have been or will be initiated within the next several years to begin establishing capabilities to treat these waste streams.

In-trench treatment of MLLW is planned for some RH MLLW or oversized CH containers generated from projects such as suspect TRU retrieval or in some cases, Tank Farm Operations (i.e., some of the LLCE may be too large to be treated by the generator). After applying for and obtaining the required permit modification, treatment to meet the Land Disposal Restriction requirements will be performed within the MLLW Disposal Units (LLBG 218-W-5 T31/T34, IDF, or ERDF) for waste packages containing debris and/or radioactive lead solids with no treatment path forward. The treatment capability consists of the use of immobilization technologies for mixed waste debris and would be limited to those technologies that can be employed in/on containerized mixed waste. This capability is anticipated to be operational no later September 30, 2006, and could be accelerated if the permit is approved earlier by the regulators.

Expanded offsite treatment is proposed for MLLW within the package size and dose rate limits of offsite capability. MLLW packages, up to dimensional and dose limits to be determined (although expected to be no greater than 500 mrem/hr and 10 m^3 in size), will be shipped offsite for treatment. Current plans are to obtain limited commercial treatment capability for RH MLLW and MLLW in large containers by September 30, 2004.

Expand/augment the use of existing facilities to sort and repackage oversized CH MLLW and TRU waste packages. Acquisition of this processing capability is critical in providing treatment for a large volume of the M-91 waste (much of which is either already in storage at CWC or will be retrieved as part of the TRU Retrieval Program). Viable options include:

- Modification of Existing Facilities: One of the facilities identified for further evaluation is the 2706-T/TA building, which could potentially be modified to accept limited quantities of TRU waste packages up to 6 ft x 6 ft x 10 ft and RH waste up to one rem/hr. The 2706-T/TA building is a certified containment structure for liquids that provides flexibility and that could be upgraded to meet seismic standards, if required. Another such facility is the 221-T Canyon, which has overhead cranes for large packages, shielded cells for storage, and ample room on the canyon deck for processing operations. In addition, both buildings are covered under the T Plant Complex's existing safety basis and permits for handling significant quantities of TRU waste and MLLW.
- Use of new processing modules either within or adjacent to an existing facility (2706-T, 221-T Canyon, WRAP, or mobile TRU processing units).
- Use of temporary containment enclosures either adjacent to or within an existing facility (such as 2706-T, 221-T Canyon, WRAP, or mobile TRU processing units and/or equipment) to handle large, unique wastes on a case-by-case basis. In addition, such structures could also be used in conjunction with the TRU retrieval operations and/or the 618-10/11 burial ground remediation to allow for limited repackaging operations. The addition of a containment structure directly over the point of excavation reduces the potential release of airborne contamination to the environment. Current commercial mobile structures are available (Figure 15) that have the system capabilities to mitigate the

In-Trench Treatment of MLLW

Scope—For some oversized and RH-MLLW (assume no more than 40% of the M-91 MLLW volume can be processed in-trench)

Cost Implications—Minimal capital costs to set up and low operational costs to implement

Schedule Constraints—Can begin no later than the end of FY06 and potentially sooner

Worker Health & Safety—Well established ES&H practices. Operational experience for GTC 3 waste and treatment-by-generator

Regulatory Acceptability—Covered by the HSW EIS and existing safety basis. RCRA Permit Modification would be needed

Benefits/Advantages—Low cost, technically acceptable alternative for some of the larger, more problematic M-91 MLLW

Project Risk/Disadvantages—Applicable only to debris and to RH waste that can be shielded to CH levels

Expanded Offsite Treatment of MLLW

Scope—For some oversized and RH-MLLW (assume no more than 10% of the M-91 MLLW volume can be sent directly offsite for processing)

Cost Implications—No capital costs to set up, some rate increases likely to deal with the larger and more radioactive waste

Schedule Constraints—Can begin by the end of FY05 and potentially sooner

Worker Health & Safety—Well established ES&H practices for offsite contractors. Additional controls may be necessary for packages with elevated dose rates

Regulatory Acceptability—Covered by the HSW EIS, and treatment providers provide safety & health documentation & permits

Benefits/Advantages—Low cost, technically acceptable alternative for a small fraction of the M-91 MLLW

Project Risk/Disadvantages—Applicable only to a small fraction of the M-91 MLLW

Figure 15. Temporary Containment Structures

limitations identified above. In addition, methodologies have been developed that enable the deployment of such structures with minimal impact on productivity and safety.

It is likely that a combination of facilities and modules will be needed to efficiently and completely meet the M-91 contact-handled oversized waste processing needs. Further analysis of throughput capability and compatibility of the waste processing mission with current work performed in these potential facility(s) will be needed. An Engineering Study (ES) and functional design criteria (FDC) for repackaging, size reduction, visual examination, and treatment of CH waste too large for current capabilities will be completed by September 30, 2005, followed by potential facility upgrades and/or acquisition of modules to support the capability in FY06.

Expanded Use of Existing Facilities for MLLW and TRU Waste

Scope—For remaining oversized CH-MLLW and oversized CH-TRU waste (assume 50% of the M-91 MLLW volume and 100% of the M-91 TRU volume will use this processing capability), limited capability for RH waste

Cost Implications—Low capital costs to implement processing specific needs. However, depending on the facility selected, general facility-wide upgrades may also be required

Schedule Constraints—Engineering study in FY05, upgrades in FY06, with full implementation in FY07, limited implementation beginning in FY05

Worker Health & Safety—Work is an extension of ongoing operations. Some additional protective measures may be needed when dealing with high-levels of transuranic contamination

Regulatory Acceptability—Most options covered by the HSW EIS, existing safety basis, and existing permits

Benefits/Advantages—Low cost, technically acceptable, accelerated alternative for a large fraction of the M-91 MLLW and TRU waste

Project Risk/Disadvantages—T Plant requires ~$15M in upgrades (electrical, water service, and roof) due to aging facility infrastructure

4.2 Longer-Term RH Waste Processing Capabilities

Additional RH capability would need to be developed to handle the highest dose MLLW packages and to process and certify the entire RH-TRU waste stream. In order to incorporate design requirements that are driven by the RH WIPP WAC, an ES/FDC for processing RH-TRU and RH-MLLW will be completed by December 31, 2007. TPA Milestones M-91-05-T01 establishes the deadline for this study. This study will define the capability to treat approximately 7% of the currently forecasted M-91 waste that is dominated by the entire RH-TRU processing stream. Two primary alternatives are considered viable and worthy of additional evaluation. They include modification of existing facilities with or without new processing modules and the potential acquisition of an onsite commercial capability.

For the **Modification of Existing Facilities** the viable options include:

- Modification of the 221-T Canyon, which has overhead cranes for large packages, shielded cells for storage, and existing safety basis and environmental permits for handling significant quantities of TRU waste and MLLW was identified as the most attractive existing facility alternative, as previously evaluated in WHC 1995 and WMFS 1998. Other existing facilities, such as the Materials and Storage Facility (MASF), Washington Nuclear Plant 1 Conversion, Fuel & Materials Examination Facility (FMEF) have been evaluated and rejected in past studies due to permitting issues, costs to upgrade, creation of additional cleanup legacy, and remote locations.
- Use of new processing modules either within or adjacent to an existing facility (2706-T, 221-T Canyon, or mobile TRU processing units).

Modification of Existing Facilities and Acquisition of New Processing Modules for RH-TRU and RH-MLLW

Scope—For RH-TRU waste and the remaining RH-MLLW (assume 50% of the M-91 RH-MLLW volume and 100% of the M-91 RH-TRU volume will use this processing capability), capability to handle oversized packages will also be needed

Cost Implications—Moderate capital and operating costs will be required to implement these processing needs since a robost, shielded and remotely operated module will be required. Depending on the facility selected, general facility-wide upgrades may also be required

Schedule Constraints—Engineering study in FY07, upgrades in FY08 through FY10, with limited implementation beginning in FY12 and potentially sooner

Worker Health & Safety—Proposed approach must include appropriate ALARA analysis and protective measures to protect workers from high-dose-rate waste. Shielded modules will likely be necessary

Regulatory Acceptability—Most options covered by the HSW EIS, existing safety basis, and existing permits

Benefits/Advantages—Moderate cost, technically acceptable, accelerated alternative for the remaining fraction of the M-91 MLLW and TRU waste

Project Risk/Disadvantages—T Plant requires ~$15M in upgrades (electrical, water service, and roof) due to aging infrastructure

The design and construction of a new/permanent processing facility has been evaluated and rejected in past studies due to the high capital costs, lengthy design, construction, and startup schedules, and the creation of an additional cleanup legacy facility that will require D&D once the limited processing mission is completed. The drastic reduction in waste volumes and the goal to accelerate the processing of the waste would only further increase the disadvantages associated with such an alternative.

The **acquisition of onsite commercial capabilities** is considered a viable alternative that can be explored with minimal risk in parallel with the development of the engineering studies and FDC for the RH capability upgrades. This option would involve issuing a series of solicitations to determine if there are vendors available willing to finance and locate a remote-handling capability on the Hanford Site. A similar approach has been used in the past at DOE's Idaho National Engineering and Enviromental Laboratory for CH waste streams.

Acquisition of Onsite Commercial Capabilities

Scope—For remaining RH-MLLW and RH-TRU waste (assume 50% of the M-91 MLLW volume and 100% of the M-91 TRU volume will use this processing capability), capability to handle large packages will be needed

Cost Implications—No upfront capital costs, operating costs will be based on volume of waste processed

Schedule Constraints—Procurement actions begin in FY06/07, decision to proceed in late FY07, installation of commercial system onsite in FY08 through FY10, with limited implementation beginning in FY10

Worker Health & Safety—Proposed approach must include appropriate ALARA analysis and protective measures to protect workers from high dose rate waste. Shielded modules will likely be necessary

Regulatory Acceptability—Would require a supplement to the HSW EIS, as well as establishment of acceptable safety basis documents and permits

Benefits/Advantages—Moderate cost and technically acceptable, while leveraging commercial experience, expertise, and technology (if found to be available)

Project Risk/Disadvantages—Identification of a viable vendor, potential delays in facility installation and regulatory permitting

5.0 Alternative Evaluation and Conclusions

The new, phased approach proposed in this evaluation would use a combination of existing and planned processing capabilities to treat the more easily managed CH waste streams first and would provide for earlier processing of these wastes. This approach would not only accelerate initiation of the processing of the M-91 waste streams, but would significantly complete the processing mission ahead of the previous baseline and the TPA-mandated processing rates and schedules by nearly a decade.

5.1 Near-Term Actions

The proposed approach would provide early processing paths for CH MLLW and CH TRU waste in large containers as well as low-dose-rate (less than 1 rem/hr) RH MLLW by:

The new, phased approach would not only accelerate initiation of the processing of the M-91 waste streams, but would significantly complete the processing mission ahead of the previous baseline and the TPA-mandated processing rates and schedules by nearly a decade.

- Expanding assistance to generators to implement Treatment-by-Generator methods for MLLW and assisting the TRU retrieval and burial ground remediation programs to avoid generation of oversized waste containers.
- Procuring limited commercial treatment capability for MLLW. Commercial capability may be able to process up to 500 mrem/hr and routinely process up to 10 m^3 packages, with larger packages handled on a case-by-case basis.
- Initiating Hanford in-trench treatment of MLLW. Long equipment pieces that are categorized as RH MLLW or oversized CH containers from suspect TRU retrieval that are shown to be MLLW may be treated in-trench.
- Leveraging existing capabilities (e.g., modification of the 2706-T/TA and/or the 221-T canyon facility) to allow processing of both TRU and MLLW in large packages and limited processing up to one rem/hr. An engineering study would be conducted in FY05 to define the size reduction and repackaging capabilities needed to accelerate the processing of the oversized CH-MLLW and oversized CH-TRU waste in storage and expected to be generated by the TRU Retrieval Program.

Near-term implementation of some of these waste processing activities could expand existing capabilities by 2005. This accelerated processing approach would support processing of some CH MLLW and low-activity RH MLLW a decade earlier than previously planned. Figure 16 provides a conceptual look at the potential "work-off" of the contact-handled waste inventory, including waste in storage, waste fore-casted by genera-tors, and waste arising from the TRU Retrieval

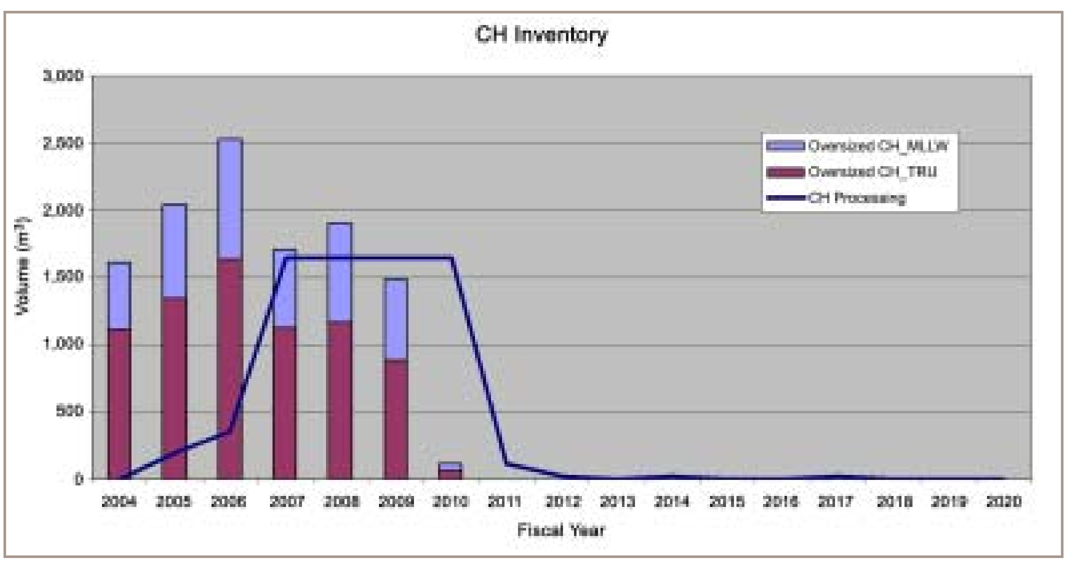

Figure 16. Processing of Oversized CH Waste

Program. It assumes that a 10% fraction of the MLLW can be sent directly offsite beginning in FY05 and 40% of the MLLW can be treated in-trench beginning in FY06. The remaining oversized CH-MLLW and CH-TRU waste would be processed in the repackaging facility/module ramping up in FY07. The processing rate for the remaining oversized CH-MLLW and the oversized CH-TRU waste is constrained at 1300 cubic meters per year (which relates to the processing of four 5 ft x 5 ft x 9 ft boxes per week). This processing rate was developed through discussions with FH T Plant personnel, based on their operation experiences, both in the T Plant canyon and at the 2706-T facility. Use of this processing rate results in the processing mission being complete (or current) near the end of 2010. A small quantity of oversized waste, associated with a single generator (tank farm operations and closure) is projected beyond 2010.

5.2 Longer-Term Actions for RH Waste

Additional study is needed for defining and selecting specific capabilities to process high-dose-rate packages, which would leverage from the ongoing experience with the more easily processed waste. The use of either new modules (stand-alone or annexes to existing facilities) or a canyon facility (T Plant) to process the highest-dose waste and the largest packages appear to be the most viable alternatives to provide the required treatment capabilities. In addition, the concept of acquiring an onsite commercial treatment capability will also be assessed. A final decision for acquisition of this capability will be determined through an Engineering Study, which is currently scheduled for completion in FY08 (December 31, 2007). This study is scheduled in FY07 to coincide with the promulgation of final Waste Isolation Pilot Plant Waste Acceptance Criteria for RH TRU waste.

Additional study is needed for defining and selecting specific capabilities to process high-dose-rate packages.

Figure 17 provides a similar "work-off" chart for the RH waste streams. It assumes that a 10% fraction of the MLLW can be sent directly offsite beginning in FY05 and 40% of the MLLW can be treated in trench beginning in FY06. The remaining RH-MLLW and all the RH-TRU waste would be processed in the RH facility/module ramping beginning in FY12. The processing rate for this RH waste processing capability is constrained at 50 cubic meters per year. This processing rate was developed through discussions with FH waste management personnel, based on their operation experiences, both at Hanford and at other RH processing facilities within the DOE complex. Based on this approach and processing rate, all RH waste backlog, including that generated by the 618-10/11 burial ground and TRU Retrieval Program, can be processed by

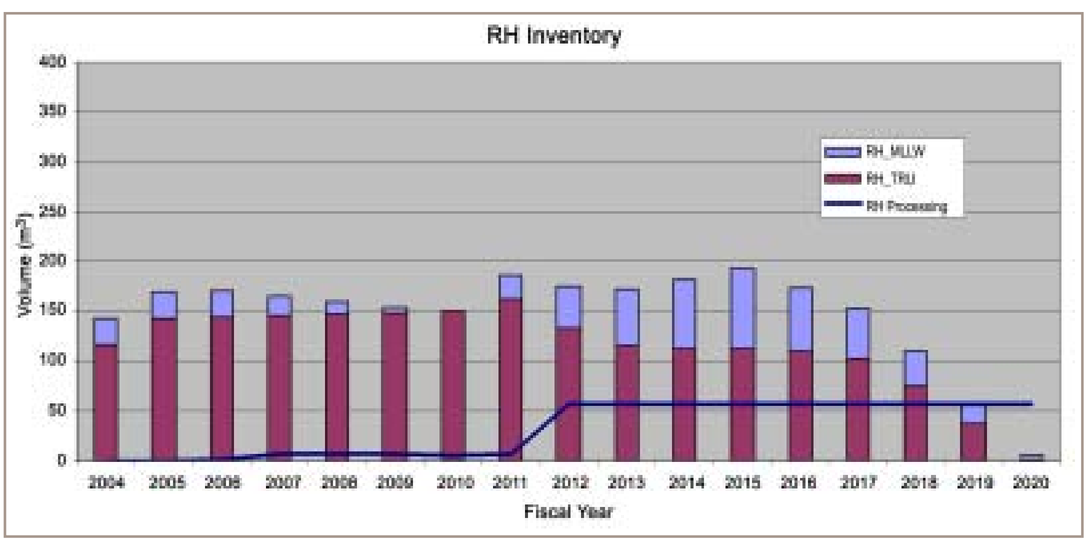

Figure 17. Processing of RH Waste

FY20 (approximately 18 months after completion of these retrieval efforts), significantly in advance of the previous baselines and the TPA Mandated processing rates. A small quantity of RH-TRU waste, associated with a single generator (tank farm operations and closure) is projected beyond FY18.

5.3 Life-Cycle Cost Comparisions

A high-level cost analysis was performed to determine the potential life-cycle cost savings that could be realized by implementing the new, phased M-91 processing approach proposed in this evaluation. In order to provide a comparable basis for this cost comparison, all costs associated with the construction, upgrade and maintenance of T Plant and/or other M-91 facilities and the costs of the processing of M-91 waste streams were included.

Appendix D contains the detailed assumptions used in developing the conceptual estimate for the new approach. Appendix E contains the source data tables used in this evaluation.[a] Figures 18 and 19 provide the comparison of life-cycle costs between the existing project planning baseline and the accelerated M-91 processing scenario. As a result of the early retirement of the T Plant facility due to accelerated processing of M-91 waste (including the expanded use of offsite and in-trench treatment), an estimated life-cycle savings of nearly $125 million is predicted. In addition, annual costs over the next 4 years were held as close to the existing baseline as possible to ensure that annual funding limitations would not unduly impact this approach. Figure 20 provides the predicted annual savings associated by implementing to new, phased M-91 processing approach.

Based on this approach and processing rate, all RH waste backlog, including that generated by the 618-10/11 burial ground and TRU Retrieval Program, can be processed by FY20 (approximately 18 months after completion of these retrieval efforts), significantly in advance of the previous baselines and the TPA Mandated processing rates.

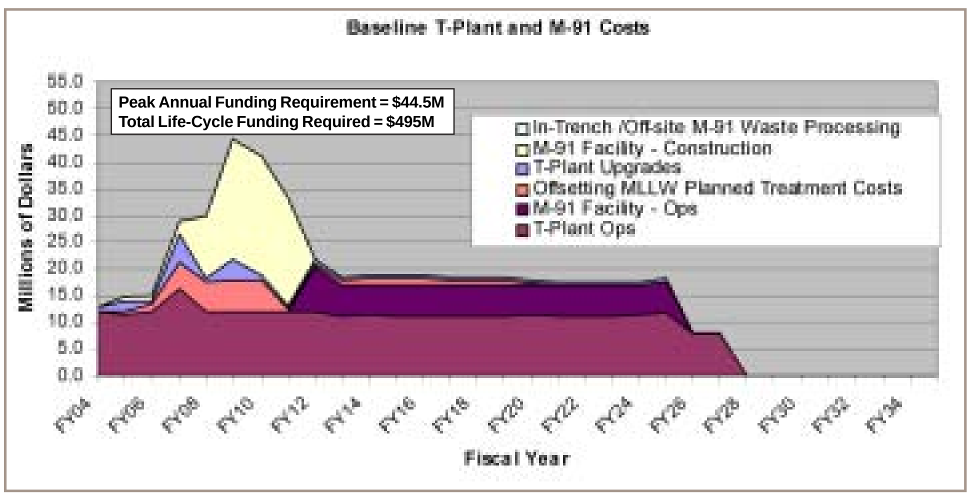

Figure 18. Existing Planning Cost Basis for the M-91 Processing Mission

(a) Source of baseline cost data is the Hanford Life-Cycle Cost Model (Dec 03 FH Baseline + March FY04 FH WM project planning baseline assumptions provided by FH WM personnel).

The detailed engineering studies planned for FY05 and FY07 will be used to validated and refine the estimates and technical approach pursued. Although the estimates included in this study were derived from existing baseline estimates, they should be considered a high-level, order-of-magnitude analysis of potential costs savings that must be validated through the development of more detailed basis of estimates.

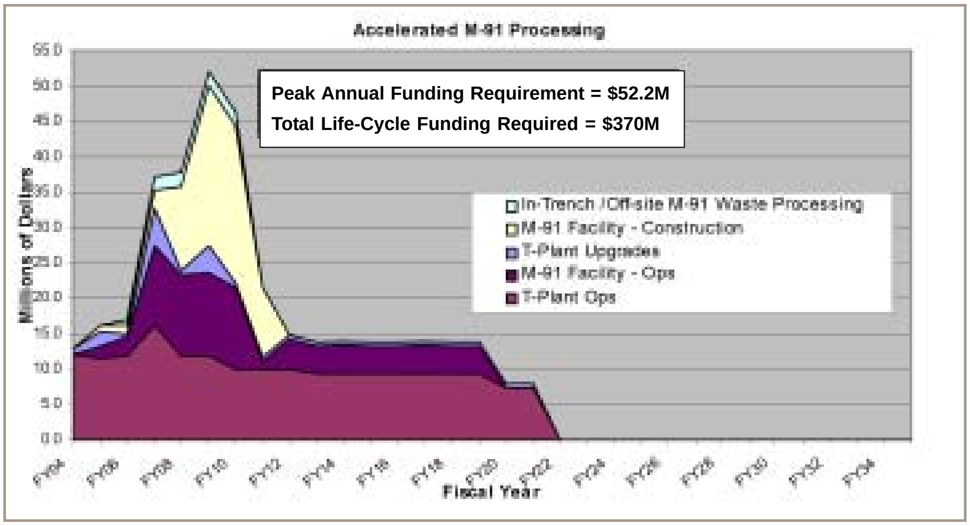

Figure 19. Accelerated Planning Cost Basis for the M-91 Processing Mission

Figure 20. Potential Cost Savings Associated with the M-91 Acceleration Approach

6.0 Recommendations and Path Forward

The following recommendations are made in an effort to accelerate waste processing, maintain a degree of flexibility and redundancy in processing capabilities (to respond to potential future changes in the waste generation, processing requirements, or expected volumes), and enable early start and completion of the processing mission. These recommendations include:

- Continue efforts to reduce the volume of waste that needs processing by an M-91 capability, including supporting Treatment-by-Generator processing and assisting retrieval operations to package waste in standard-size containers if possible. Work with tank farm operations and closure contractor(s) to determine if alternative capabilities can be provided for the waste generated after 2019.
- Expand existing commercial MLLW treatment contracts to accept larger and higher-dose-rate packages.
- Work with the regulators on a permit modification to allow in-trench treatment for a fraction of the oversized and RH-MLLW.
- Conduct an engineering study in FY05 to define the size reduction and repackaging capabilities needed to accelerate the processing of the oversized CH-MLLW and oversized CH-TRU waste in storage and expected to be generated by the TRU Retrieval Program and to validate and update the assumptions used in this document. Options including modification of existing facilities, use of modules within or adjacent to existing facilities, and use of temporary containment enclosures should be considered. Acquire this capability in FY06 to allow processing to commence in FY07 resulting in the processing of CH M-91 wastes to be complete (or current) by FY11, with small amounts of newly generated oversized CH wastes to be processed as generated after that.
- Beginning in FY06, initiate the solicitation process (e.g. preparation of procurement documents, scope statements, etc.), through a request for interest, to ascertain the viability of implementing a commercial processing capability for the RH-TRU and remaining RH-MLLW.
- Conduct an engineering study in FY07 (in conjunction with the release of the WIPP RH-TRU WAC) to define the RH waste processing and treatment capabilities needed to complete the M-91 processing mission.
- Based on the solicitation process and the engineering study, a decision point will occur in late FY07 (in conjunction with TPA Milestone M-91-05-T01) to determine the preferred RH processing approach. This capability will then be acquired (FY08 – FY10), allowing processing to commence in FY12 and potentially sooner.
- Optimize T Plant facility upgrades and operational missions to continue to reduce the volume of backlogged waste, and provide continuity of waste processing missions and expertise.

The following recommendations are made in an effort to accelerate waste processing, maintain a degree of flexibility and redundancy in processing capabilities, and to enable early start and completion of the processing mission.

The M-91 Processing Path Forward Timeline is provided in Figure 21. Current budgets for FY04 through FY32 provide some planned funding for these actions. Some rearrangement of budgets will be needed to implement these recommendations.

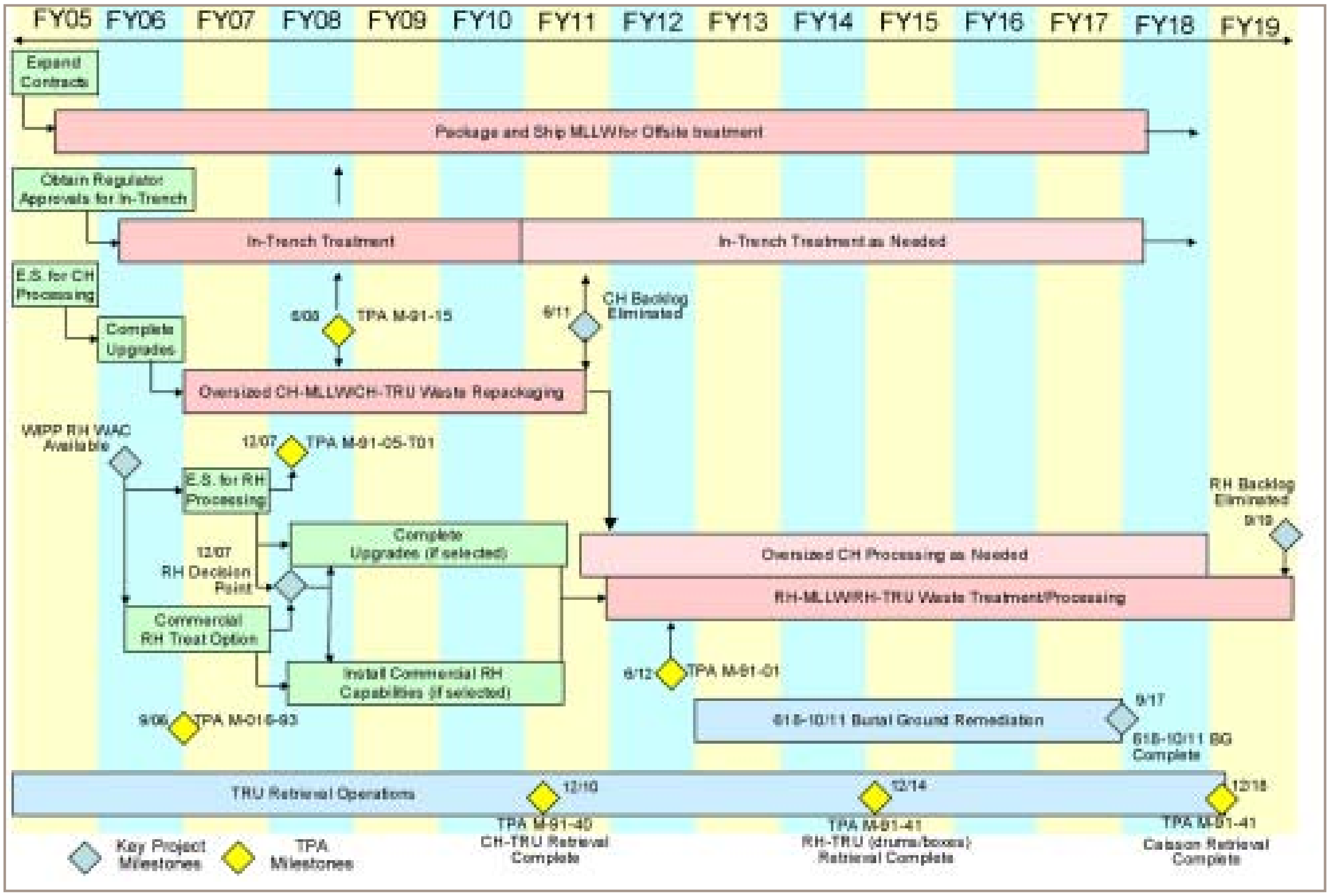

Figure 21. Proposed M-91 Processing Path Forward Timeline

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8.0 Glossary

2706-T/TA – A small exterior building within the T Plant complex that is used for a variety of equipment decontamination and waste packaging and processing operations.

activity – A measure of the quantity of a radioactive material, the special unit of which is the curie and the SI unit is the bequerel.

caisson – Reinforced cylindrical steel and concrete underground structures 2.4 m (8 ft) in diameter and 3 m (10 ft) high designed to store remote-handled waste in the Low Level Burial Grounds.

cask – A heavily shielded container used to store or ship radioactive materials.

Category 1 low-level waste – Low-level radioactive waste containing radionuclide concentrations within the maximum limits defined for this waste type in the Hanford Site Solid Waste Acceptance Criteria (HSSWAC). These limits are site-specific, and they define the lowest activity category of low-level radioactive waste. Category 1 wastes typically do not require special packaging or treatment for disposal by shallow land burial.

Category 3 low-level waste – Low-level radioactive waste containing radionuclide concentrations greater than those defined for Category 1 waste, but within the maximum limits defined for Category 3 waste in the HSSWAC. These limits are site-specific, and are established using the performance assessment for a particular disposal facility. Category 3 wastes typically require special packaging or treatment for disposal by shallow land burial.

cleanup – The term cleanup refers the full range of projects and activities being undertaken to address environmental and legacy waste issues associated with the Hanford Site.

closure – As applied to radioactive and hazardous waste disposal facilities, the process of site stabilization and placement of caps or other barriers to provide long-term confinement of the waste.

contact-handled (CH) waste – Generally, packaged waste whose external surface dose rate does not exceed 200 mrem/hr and does not create a high radiation area (>100 mrem/hr at 30 cm). See also remote-handled waste.

dangerous waste – Solid waste designated in WAC 173-303-070 through WAC 173-303-100 as dangerous or extremely hazardous waste, or mixed waste.

deactivation – As applied to waste treatment, the removal of the hazardous characteristics of a waste due to its ignitability, corrosivity, and or reactivity.

decommissioning – Officially remove from service or demolish a facility.

decontamination – Final actions taken to reduce the potential health and safety impacts of DOE-contaminated facilities, including activities to stabilize, reduce, or remove radioactive and hazardous materials. Includes the removal, reduction, or neutralization of radionuclides and/or hazardous materials from contaminated facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques.

disposal – As generally used in this document, placement of waste with no intent to retrieve. Statutory or regulatory definitions of disposal may differ.

dose – The accumulated radiation or hazardous substance delivered to the whole body, or a specified tissue or organ, within a specified time interval, originating from an external or internal source.

generator – Within the context of this document, generators refer to organizations within DOE or managed by DOE whose act or process produces low-level waste, mixed low-level waste, or transuranic waste.

greater than Category 3 (GTC3) low-level waste – Low-level radioactive waste that exceeds the maximum radionuclide concentrations as defined for Category 3 low-level waste. See also Category 3 waste.

Hanford Federal Facility Agreement and Consent Order – See Tri-Party Agreement.

hazardous waste – Waste that contains chemically hazardous constituents regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), as amended (40 CFR 261) and regulated as a hazardous waste and/or mixed waste by the EPA. May also include solid waste designated by Washington State in WAC 173-303-070 through WAC 173-303-100 as dangerous or extremely hazardous waste, or mixed waste. See also mixed low-level waste.

high-integrity container (HIC) – A container that provides additional confinement for remote-handled Category 3 LLW and some contact-handled Category 3 LLW and is typically constructed of concrete or other durable material.

immobilization – Placing the waste within a material such as concrete or a glass to immobilize (reduce dispersability and leachability of) the radioactive or hazardous components within the waste. See also stabilization.

in-trench grouting – In-trench grouting involves placing the waste on a cement pad or on spacers, installing reinforcement steel and forms around the waste, and covering the waste with fresh concrete to encapsulate the waste within a concrete barrier.

land disposal restrictions – The restrictions and requirements for land disposal of hazardous or dangerous waste as specified in 40 CFR 268 (RCRA) and WAC 173-303-140 (Washington State Dangerous Waste Regulations).

low-level (radioactive) waste (LLW) – Radioactive waste that is not high-level waste, spent nuclear fuel, transuranic waste, byproduct material (as defined in section 11e[2] of the Atomic Energy Act of 1954, as amended), or naturally occurring radioactive material.

macroencapsulation – Treatment method applicable to debris wastes as defined by RCRA. Refers to application of surface coating materials, such as polymeric organics (for example, resins and plastics) or of a jacket of inert material to reduce surface exposure to potential leaching media.

mixed low-level waste (MLLW) – Low-level waste determined to contain both source, special nuclear, or byproduct material subject to the Atomic Energy Act of 1954, as amended, and a hazardous component subject to the Resource Conservation and Recovery Act (RCRA), as amended, or Washington State Dangerous Waste Regulations. See also hazardous waste, dangerous waste.

non-standard (packaging) – Non-standard waste packages refer to specially designed waste containers or packages used for large, or odd shaped low-level waste, mixed low-level waste or transuranic waste items or items with high dose rates or other unique conditions. See also standard (packaging).

normal operations – As used in this document, normal operations refers to routine waste management activities, for example, waste treatment activities (including processing), packaging and repackaging, storage, and final disposal of waste.

oversized – As used in this report refers to containers of MLLW greater in size than 10 m^3 (equivalent to a 6'x6'x10' box) and containers of TRU waste larger than a standard waste box (SWB).

processing – As used in this report, refers to any activity necessary to prepare waste for disposal. Processing waste may consist of repackaging, removal, or stabilization of non-conforming waste, or treatment of physically or chemically hazardous constituents in compliance with state or federal regulations.

radioactive waste – In general, waste that is managed for its radioactive content. Waste material that contains source, special nuclear, or by-product material is subject to regulation as radioactive waste under the Atomic Energy Act.

rem – The special unit of radiation effective dose equivalent (1 rem = 0.01 Sievert).

remedial action – Activities conducted to reduce potential risks to people and/or harm to the environment from radioactive and/or hazardous substance contamination. See also cleanup.

remote-handled (RH) waste – Packaged radioactive waste for which the external dose rate exceeds that defined for contact-handled waste (generally 200 mrem/hr at the container surface). These wastes require handling using remotely controlled equipment, or placement in shielded containers, to reduce the human exposures during routine waste management activities. See also contact-handled waste.

retrievably stored waste – Waste stored in a manner that is intended to permit retrieval at a future time.

site – A geographic entity comprising leased or owned land, buildings, and other structures required to perform program activities.

stabilization – Mixing an agent such as Portland cement with the waste to increase the mechanical strength of the resulting waste form and decrease its leachability.

standard (packaging) – Standard waste packages refer to the common forms of waste packages (such as drums and boxes) used for low-level waste and mixed low-level waste. See also non-standard (packaging).

storage – The holding of waste for a temporary period, at the end of which the waste is treated, disposed of, or stored elsewhere.

T Plant Complex – The collection of buildings, environmental permits, and safety basis documentation associated with the entire T Plant facility complex.

T Plant Canyon – The building 221-T, within the T Plant complex, which has shield processing cells, thick shield walls, a processing deck, and installed cranes for moving large items.

Transuranic isotope – Isotopes of any element having an atomic number greater than 92 (the atomic number of uranium).

transuranic (TRU) waste – Transuranic waste is radioactive waste containing more than 100 nanocuries (3700 becquerels) of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for the following:

- high-level radioactive waste
- waste that the Secretary of Energy has determined, with the concurrence of the Administrator of the Environmental Protection Agency, does not need the degree of isolation required by the 40 CFR Part 191 disposal regulations
- waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR 61.

For the purposes of this document TRU waste may also include hazardous constituents, and may be referred to in the document as mixed TRU waste or TRU (M).

treatment – The physical, chemical, or biological processing of dangerous waste to make such waste non-dangerous or less dangerous, safer for transport, amenable for energy or material resource recovery, amenable for storage, or reduced in volume, with the exception of compacting, repackaging, and sorting as allowed under WAC 173-303-400 and 173-303-600.

Tri-Party Agreement (TPA) – Informal title for the "Hanford Federal Facility Agreement and Consent Order," an agreement between the U.S. Department of Energy, the U.S. Environmental Protection Agency, and the Washington State Department of Ecology. The agreement establishes milestones to bring operating DOE facilities into compliance with the RCRA, and to coordinate cleanup of Hanford's inactive disposal sites under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

waste characterization – The identification of waste composition and properties, whether by review of process knowledge, or by non-destructive examination, non-destructive assay, or sampling and analysis, to determine appropriate storage, treatment, handling, transportation, and disposal requirements.

waste certification – A process by which a waste generator certifies that a given waste or waste stream meets the waste acceptance criteria of the facility to which the generator intends to transfer waste for treatment, storage, or disposal.

waste container – Any portable device in which a material is stored, transported, treated, disposed, or otherwise handled. A waste container may include any liner or shielding material that is intended to accompany the waste in disposal. At Hanford, waste containers typically consist of 55 gal (208-L) or 85-gal (320-L) drums and standard waste boxes. Other sizes and styles of containers may also be employed depending on the physical, radiological, and chemical characteristics of the waste.

waste life cycle – The life of a waste from generation through storage, treatment, transportation, and disposal.

waste stream – A waste or group of wastes from a process or a facility with similar physical, chemical, or radiological properties. In the context of this document, a waste stream is defined as a collection of wastes with physical and chemical characteristics that will generally require the same management approach (that is, use of the same storage, treatment, and disposal capabilities).

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Appendix A—Current Capabilities of the T Plant Complex

The T Plant complex has existing air and interim-status dangerous waste permits that provide for relatively high capacities of a wide range of treatment and storage activities. It also has an existing safety basis that supports these activities. This allows the T Plant complex to be used as a "problem-solving" facility for waste streams requiring initial or further characterization, treatment, or repackaging. The facility also provides storage capability, including capacity for wastes with storage challenges such as RH mixed wastes not suitable for storage elsewhere, and high-dose-rate materials that may need to be placed in a cell for storage. These functions are outlined in Table A.1.

Table A.1. Current Capabilities of T Plant Complex

Function / Description	Location / Alternative
1. Waste sampling, characterization and treatment of low-dose-rate LLW and MLLW	Primarily 2706-T complex
2. Waste repackaging / segregation of low-dose-rate LLW and MW. Decontamination of large equipment (up to railcar size).	Primarily 2706-T complex
3. Waste sampling and characterization of CH TRU, RH TRU, high-dose-rate items, and large equipment (up to 45 tons).	221-T Canyon
4. Waste Treatment: A variety of waste treatments can be conducted at T Plant. Treatment covered by the permit includes, but is not limited to, sorting, segregation, repackaging, neutralization, absorption, macroencapsulation, and compaction.	2706-T and 221-T Canyon (broken down as stated in 1-3 above)
5. Correction of newly generated waste with verification failures or waste packages that the generators have identified as being non-compliant with the waste acceptance criteria for the intended receiving facility.	2706-T and 221-T Canyon (broken down as stated in 1-3 above)
6. Visual verification of newly generated wastes.	2706-T and 221-T Canyon (broken down as stated in 1-3 above)
7. Mixed and radioactive waste storage. This waste, with the exception of specific subcategories mentioned elsewhere in this table, is primarily waste staged for one of the other T-Plant activities such as characterization or repackaging or awaiting shipment to disposal or WRAP.	Various locations, including outside pads within the TSD boundary.
8. RH-MLLW / RH-TRU waste storage	Primarily canyon cells. Alternatives are limited because mixed waste must be in permitted TSDs and RH storage is not allowed in many facilities such as CWC (unless shielded to CH levels). In addition, many facilities do not have shielding capabilities to the levels needed to reduce RH to CH levels.
9. RH non-mixed waste storage, such as RH-TRU waste, that must be stored pending finalization of the RH WIPP WAC and processing for shipment to WIPP	Canyon cells or vaults. Currently, storage often occurs in HICs in the LLBG.
10. K-Basin interim sludge storage. A final decision for interim storage and treatment of sludge has not been made. Several scenarios are under consideration, some of which may involve interim storage of sludge at T Plant	T Plant storage would be in canyon cells. Several other Site alternatives are being discussed, with permit requirements presenting a significant barrier to many of those alternatives.
11. Head Space Gas Sampling	2706-T. This sampling may be conducted with mobile processing units and at CWC.

Appendix B—M-91 Waste Volume Forecasts

Table B.1. Historic Waste Volume Forecasts[(a)]

Forecast	Cont Size	Inventory	Retrievably Stored	Previous Forecasts				
				2004	2003	2002	2001	2000[1]
CH-MLLW (Large)	>10m³	311	2,614	-	266	246	3,411	653
CH-MLLW (Large LDR-Compliant)[2]	>10m³	-	-	48	83	2,188	-	
RH-MLLW (Large)	>10m³	-	-	-	-	-	-	22,947
RH-MLLW (Large LDR-Compliant)[2]	>10m³	-	-	1,577	21,769	21,769	23,451	
RH-MLLW (Non-LDR-Compliant)		27	153	6	2,259	761	2,500	7,696
RH-MLLW (LDR-Compliant)[2]		-	-	640	4,885	5,803	5,039	
CH-TRU	>5x5x9	452	5,041	199	519	492	880	636
CH-TRU	5x5x9<>SWB	299	460	-	-	-	12	-
RH-TRU		50	79	270	1,698	1,296	918	1,561
M-91 (non-shaded) totals		1,138	6,347	475	4,742	2,794	7,721	33,493

1 The 2000 and previous forecasts do not identify the LDR-compliant waste
2 LDR compliant waste do n ot require M-91 treatment

(a) Waste volume projections are obtained from the Solid Waste Integrated Forecast Technical (SWIFT) database, with forecast updates from December 2003.

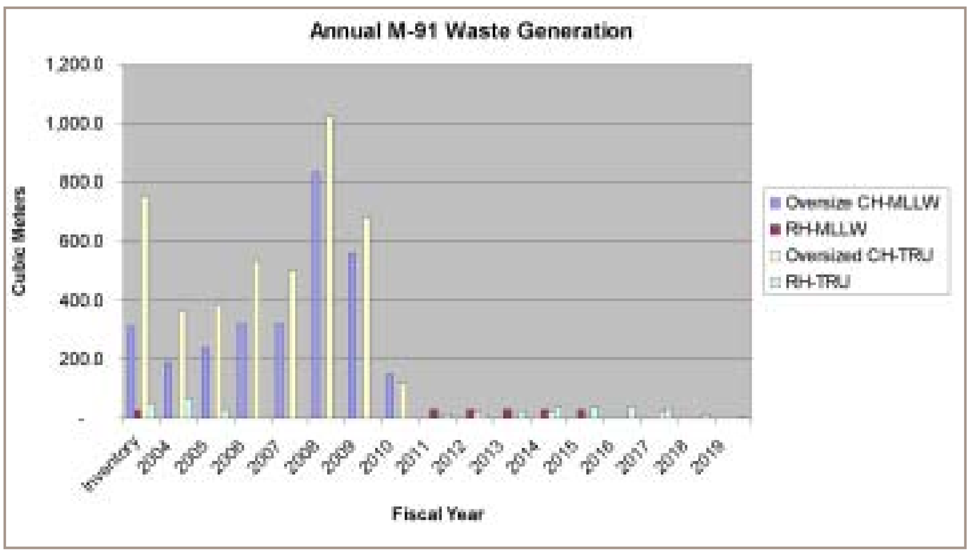

Figure B.1. Annual Waste Generation Projections (Including: Inventory, TRU Retrieval Program, and Forecasts from SWIFT Database)

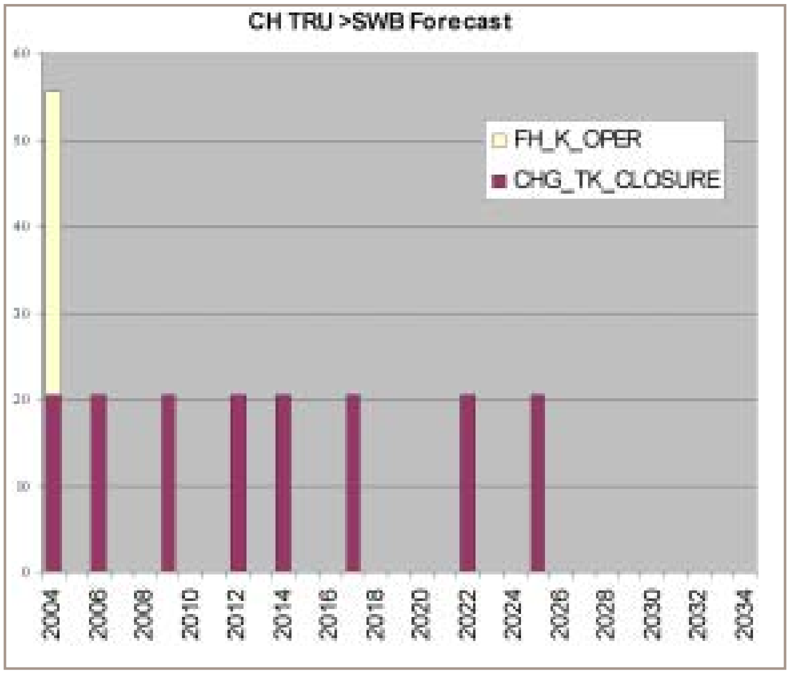

Figure B.2 Oversized Contact-Handled TRU Waste Forecasts from SWIFT Database

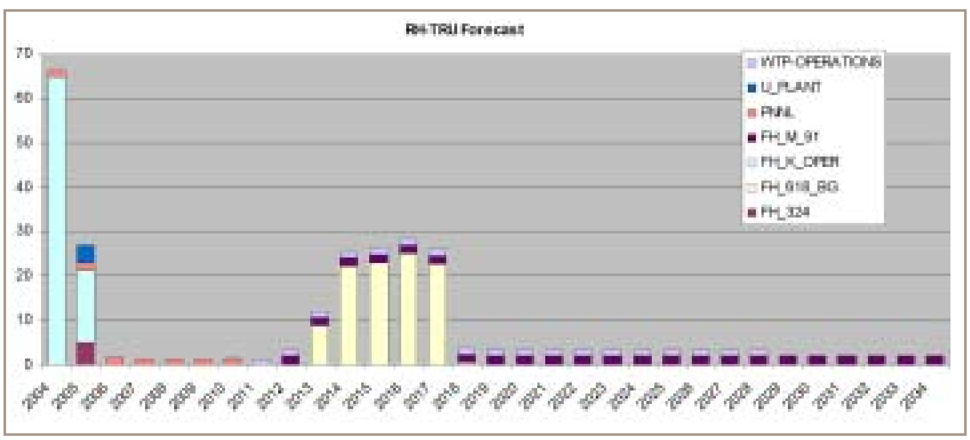

Figure B.3 Remote-Handled TRU Waste Forecasts from SWIFT Database

Appendix C—Evaluation of Alternatives

Table C.1. Qualitative Evaluation of Alternatives

Alternative	Description/ Scope	Waste Streams	Cost Implications	Schedule Constraints	Worker Health & Safety	Regulatory Acceptability	Benefits	Risk
Near-term MLLW Treatment Options Using Existing Capabilities[(a)]								
In-Trench	In-trench Macro-encapsulation of waste	Some RH-MLLW and oversized CH-MLLW	This option is very attractive from a cost viewpoint. Direct costs are assumed to be $4k-$7k/m^3. Facility permitting, upgrade, maintenance, and D&D costs are largely avoided.	Can be implemented as soon as permitting documentation can be put in place. No facility modification or upgrade delays.	This option will require special considerations when implementing to ensure workers and the environment are sufficiently protected. However, experience gained in treating GTC 3 waste and treatment-by-generator can be used in establishing ES&H requirements.	This is an area where this option has some vulnerability. Ecology has been reluctant to grant the wide-scale use of in-trench treatment in the past. This reluctance will need to be overcome and a modification to the RCRA Site permit will be required. This approach is covered by the HSW EIS.	Clear cost and schedule acceleration advantages with proven technologies and approaches.	Applicable only to debris MLLW and to RH wastes that can be shielded to CH levels. Must be able to convince Ecology of the benefits of this approach to allow it to proceed further.
Offsite Contracts	Expand use of contracts to handle higher dose and larger packages	Limited RH-MLLW and oversized CH-MLLW	This option is very attractive from a cost viewpoint, if the incremental costs to handle oversized or higher dose rate items are not excessive. No capital costs are needed.	Can be implemented nearly immediately. Assumes processing can begin in FY05.	Health & Safety standards and practices for the commercial vendors are well established. Some additional controls may be necessary as both size and dose rates of packages are increased.	Contractors provide the health & safety standards and regulatory permits for the treatment. Changes may require vendors to update their permits. This approach is covered by the HSW EIS.	Low capital cost, technically proven alternative for a small fraction of the M-91 waste stream.	Only applicable to a small fraction of the M-91 waste stream. Cost premiums are likely to be charged for the higher dose rate and oversized packages.
Other Near-term Options for CH Repackaging/Size Reduction Capability[(b)]								
Modification of Facilities	Modification of Existing Facility(s) — T Plant Canyon and 2706-T	Oversized CH-MLLW and CH-TRU waste	Low capital costs needed to implement processing related upgrades/modules. (<$1M) Containment tents within T Plant canyon (for the oversized CH TRU waste) and within 2706-T (for the oversized CH MLLW) have modest minimal capital costs. Operating costs are well understood and this approach is largely an extension of existing practices.	An engineering study would need to be performed in FY05 to finalize the design requirements, approach, and location of the capabilities. If the T Plant alternative is not selected, delays in permitting and safety basis planning could result.	In general, this work would be an extension of existing practices. In cases of high levels of TRU contamination, additional protective measures would be needed (e.g., engineered barriers, ventilation, personnel protective equipment).	Most probable options covered by the HSW EIS, existing safety basis, and existing environmental permits.	Low cost, technically acceptable, accelerated alternative for a large fraction of the M-91 MLLW and TRU waste currently in inventory or to be generated over the next 5 years. Material handling capabilities exist at T Plant.	T Plant requires ~$15M in plant-wide upgrades (electrical, water service, and roof) due to aging facility infrastructure.
New Processing Modules	Use of New Processing Modules	Oversized CH-MLLW and CH-TRU Waste	Standalone modules will likely have a slightly higher capital cost than modules/upgrades within an existing facility. Start-up and permitting costs would need to be included as well.	Standalone modules may take longer to procure and startup than facility modifications, thus further delaying processing.	In general, this work would be an extension of existing practices. In cases of high levels of TRU contamination, additional protective measures would be needed (e.g., engineered barriers, ventilation, personnel protective equipment).	Most probable options covered by the HSW EIS (such as the use of APLs). Development of safety basis and environmental permits may be needed.	Low cost, technically acceptable, accelerated alternative. Avoids heavy mortgage costs associated with existing/aging facilities. Could be collocated with an existing facility (2706-T, WRAP, etc.) to streamline processing options.	Schedule delays are possible with the standalone module approach and would require additional management attention.
Temporary Enclosures	Use of Temporary Containment Enclosures in conjunction with retrieval/remedial operations.	Oversized CH-MLLW and CH-TRU waste	Costs are generally low, on the order of $10'sk to low $100'sk	May impact retrieval schedules and plans if repackaging operations are performed in the field.	Potential health and Safety concerns requiring enhanced controls in the field. Hazards would be exacerbated by opening intact containers.	Would require safety and environmental reviews prior to implementing.	Viable option for repacking damaged oversized containers into standard waste packages.	Limited applicability. Possible worker health & safety concerns. Possible coordination concerns with the retrieval/remedial operations.

(a) These options expand the use of existing capabilities for higher dose rate and larger MLLW packages.
(b) Use or modification of other onsite processing facilities or construction of a new facility were not considered possible alternatives for the near-term accelerated CH processing capability due to the extended time needed to design, construct, permit, and start up such a capability.

Table C.1. Qualitative Evaluation of Alternatives (contd)

Alternative	Description/ Scope	Waste Streams	Cost Implications	Schedule Constraints	Worker Health & Safety	Regulatory Acceptability	Benefits	Risk
RH Processing/Treatment Capability[c]								
Modification of T Plant Canyon	Modification of Existing Facility - T Plant Canyon	Remaining RH-MLLW and RH-TRU waste	Moderate capital costs ($50M to $100M range)	An Engineering Study (ES) would need to be performed in FY07 allowing upgrades to be made in FY08 – FY10. T Plant wide upgrades can be implemented earlier.	RH Modules within the T Plant canyon are compatible with past and ongoing operations. High dose rates and contamination levels will require additional protective measures (e.g., engineered barriers/shielding, remote operations, ventilation, personnel protective equipment).	T Plant is currently permitted to handle wastes of these types. DNFSB issues, associated with the aging T Plant facility, would have to be addressed. Covered by the HSW EIS preferred alternative.	Moderate costs, technical acceptable, accelerated alternative for the remaining fraction of M-91 MLLW and TRU waste requiring processing.	T Plant complex wide upgrades are an additional cost.
Modification of other Existing Hanford Facility	Modification of other Exist -ing Facility(s)– FMEF, MASF, & WNP #1	Remaining RH-MLLW and RH-TRU waste	Moderate capital costs ($50M to $100M range) for processing modifications could introduce new D&D costs.	An ES would need to be performed in FY07 allowing upgrades to be made in FY08 – FY10.	RH modules within other existing facilities may not be compatible with their past operations. High dose rates and contamination levels will require additional protective measures (e.g., engineered barriers/shielding, remote operations, ventilation, personnel protective equipment).	It would be very difficult, both in terms of time and cost in obtaining regulatory permits for an existing facility that was not built for such a mission. A supplement to the HSW EIS would likely be needed.	Because some of the other facilities considered are currently uncontaminated, installation and upgrade costs for new modules would likely be less than for T Plant.	As documented in previous M-91 evaluations, this option is not deemed a viable alternative due to the cost and time needed to implement, location disadvantages, and creation of new legacy cleanup costs.
New Processing Modules	Use of New Processing Modules within or adjacent to an existing facility	Remaining RH-MLLW and RH-TRU waste	Moderate capital costs ($50M to $100M range), along with permitting and startup costs.	An ES would need to be performed in FY07 allowing upgrades to be made in FY08 – FY10.	RH modules dealing with high dose rates and contamination levels will require additional protective measures (e.g., engineered barriers/shielding, remote operations, ventilation, personnel protective equipment).	A standalone module would need to undergo new permitting and safety basis documentation. However, a module located either within or adjacent to an existing facility would only require updates to such documentation. A supplement to the HSW EIS could be needed.	Moderate costs, technically acceptable, accelerated alternative for the remaining fraction of M-91 MLLW and TRU waste requiring processing.	If pursued as a standalone option, permitting and start-up actions could impact implementation.
New Processing Facility	New Onsite Facility – Line Item	Remaining RH-MLLW and RH-TRU waste	High capital and startup costs ($350M + range)	An ES would need to be performed in FY07 allowing design and funding decisions to proceed. Design and construction would occur over the next 5 years with startup not possible until 2012 at the earliest.	A new facility would be designed and constructed to protect workers and the environment from the hazards associated with these waste streams.	A new facility would require a complete set of safety basis and environmental permits. A supplement to the HSW EIS would be required since this alternative was evaluated and not selected as the preferred alternative.	New facility with modern controls and features.	This option is not deemed a viable alternative for the relatively small volume of RH waste to be processed and the time and costs needed to implement.
Commercial Capability	Acquisition of Onsite Commercial Capability	Remaining RH-MLLW and RH-TRU waste	Low Capital cost potential. Premium unit costs per volume of waste processed is likely	Interests from contractors can be obtained in FY07. Timing for implementation is highly uncertain.	A commercial facility would be required to protect workers and the environment from the hazards associated with these waste streams.	Regulatory requirements for such an option are highly uncertain and difficult to quantify. A supplement to the HSW EIS would be required.	Transfers construction and startup costs to the contractor.	At this time commercially available RH-TRU waste processing capabilities do not exist. High unit costs likely, along with contractual penalties if feed volume is not maintained.

(c) RH processing capabilities will be needed for the RH-TRU waste and will be largely dictated by the RH WAC for WIPP. RH processing capabilities will also be needed for the MLLW that can't be treated offsite or in-trench.

Appendix D—Assumptions

Table D.1. Proposed Waste Volume Processing Scheme[(a)]

Waste	Process	Type	% of Total	Volume (m^3)	Years
MLLW	In-Trench	CH	40%	1,170	2007-2010
		RH	40%	74.5	2007-2020
	Offsite	CH	10%	292	2006-2010
		RH	10%	18.6	2006-2020
	Repackage CH	CH	50%	1,462	2005-2011
		RH	-	-	-
	RH Facility	CH	-	-	-
		RH	50%	93	2012-2020
TRU	Repackage CH	CH	100%	4,409	2005-2011
	RH Facility	RH	100%	365	2012-2020

Waste Volume Estimate Assumptions

- Mixed Waste smaller than 10 m^3 (~ 6 ft x 6 ft x 10 ft box) can be routinely processed and treated for disposal using existing onsite capabilities and offsite contracts.
- TRU waste smaller than a Standard Waste Box (SWB) can be processed using existing capabilities (WRAP, APLs or other mobile processing lines and box counters).
- The small volume of CH-TRU waste (~40.8 m^3 forecasted in FY22 and FY25) and RH-TRU waste (~44 m^3, 3.2 m^3/year in FY19-FY28 dropping to 1.9 m^3/year in FY29-FY34) forecast by the Tank Waste Program after FY19 are assumed to be either generated earlier (allowing processing through the M-91 capabilities as part of accelerated tank waste processing and closure options) or can be incorporated into the overall Waste Treatment Plant D&D plans and tank closure processes, if these waste streams are proven to be valid.

Waste Volume Processing Assumptions

- 10% of the M-91 MLLW predicted (~290 m^3 oversized CH-MLLW and ~19 m^3 of RH-MLLW) can be processed using expanded off-site contracting capabilities (plans are to increase dose rates up to 500 mrem/hr on contact and routinely process 10 m^3 packages with the capabilities to handle special packages up to 14 m^3). The CH-MLLW volume is assumed to be uniformly processed over a five year period beginning in FY06. The RH-MLLW volume is assumed to be uniformly processed over a fifteen year period beginning in FY06.
- To expand the use of the existing MLLW treatment contracts, it is assumed contracting modifications need to be negotiated and finalized in FY05.

(a) Waste volumes are based on data provided in Appendix B.

- 40% of the M-91 MLLW predicted (~1170 m^3 oversized CH-MLLW and 75 m^3 of RH-MLLW) can be processed using in-trench treatment capabilities. The CH-MLLW volume is assumed to be uniformly processed over a 4-year period beginning in FY07. The RH-MLLW volume is assumed to be uniformly processed over a 14-year period beginning in FY07.
- To allow in-trench treatment for MLLW permit modifications will need to be negotiated and finalized in FY05/FY06.
- 50% of the oversized CH-MLLW (~1,462 m^3) and 100% of the oversized CH-TRU waste (4,409 m^3) must be processed/treated in a size reduction/repackaging capability used for the accelerated processing of the M-91 oversized CH wastes. This combined volume is assumed to be processed at a maximum rate of 1300 m^3/year (assumes the processing of four 5 ft x 5 ft x 9 ft waste boxes per week). Processing is assumed to slowly ramp up using existing capabilities (both 2706-T and T Plant Canyon) beginning in FY05. The maximum processing rate will not be reached until FY07 after facility upgrades and modules have been put in place, allowing processing to be completely current by FY11 (with less than 1% of the oversized CH-TRU wastes left to be processed as generated).
- To have fully functional CH-oversized waste size reduction/repackaging capability an engineering study to refine the cost estimates and select the best technical approach must be performed in FY05, allowing need upgrades and/or the procurement of processing modules to be accomplished in FY06.
- 50% of the RH-MLLW (~93 m^3) and 100% of the RH-TRU waste (365 m^3) must be processed/treated in a RH processing capability. This combined volume is assumed to be processed at a maximum rate of 50 m^3/year. Processing is assumed to begin in FY12 after facility upgrades and modules have been put in place, allowing processing to be completely current by FY20 (with less than 9% of the RH-TRU wastes left to be processed as generated).
- To have fully functional RH Processing capability an engineering study to refine the cost estimates and select the best technical approach must be performed in FY07, allowing need upgrades and/or the procurement of processing modules to be accomplished in FY08 – FY11.

Cost Estimating Assumptions

- It is assumed that 90% of the oversized CH-MLLW predicted will be debris and can be treated using macroencapsulation techniques and that the remaining fraction will require thermal or other more extensive treatment after repackaging.
- It is assumed that T Plant will be used (both the 2706-T facility for MLLW and the T Plant Canyon for TRU waste) for the size reduction/repackaging capability used for the accelerated processing of the M-91 oversized CH wastes.
- It is assumed that T Plant Canyon will be used for the processing/treatment of the M-91 RH wastes, which can't be processed offsite or in-trench.
- Cost to treat MLLW offsite is assumed to be $7K/$m^3$ for macroencapsulation of oversized CH-MLLW, $10K/$m^3$ for macroencapsulation of RH-MLLW and $60K/$m^3$ for thermal treatment.

- Cost to treat MLLW in-trench is assumed to be $4K/m^3 for oversized CH-MLLW and $7K/m^3 for RH-MLLW.
- Cost to process/treat CH waste in the size reduction/repackaging facility is assumed to be $6K/m^3 for size reduction and macroencapsulation of oversized CH-MLLW (assumed onsite costs savings of 15% over offsite costs from transportation and other savings), $8K/m^3 for repackaging and processing of oversized CH-TRU waste, and $60K/m^3 for repackaging and processing of MLLW requiring thermal treatment.
- Cost to treat and process the RH-MLLW and RH-TRU waste at an RH facility is assumed to be $80K/m^3.
- Costs for facility-wide T Plant upgrades were unchanged.
- T Plant minimum safe operating costs were reduced, beginning in FY10 to account for staffing efficiencies gained better through utilization of T plant staff for both minimum safe operation activities and M-91 processing activities.
- Existing MLLW budgets are sufficient to cover near-term staff activities necessary to obtain regulatory approvals for in-trench treatment and to expand existing MLLW contracts.
- The current budget profiles for M-91 facility development in FY05-FY07 were preserved and are assumed to be sufficient to cover:
  - the FY05 engineering study needed to define the CH repackaging, size reduction, and treatment capability(s),
  - the FY06 T Plant facility upgrades/modifications needed to specifically support the CH waste processing mission (e.g., installation of tents or modules in 2706-T and in the T Plant Canyon),
  - the FY07 engineering study for RH processing capabilities, and
  - the FY07 procurement activities needed to explore the potential for commercialization of the RH processing mission.
- The current M-91 budget for construction of the overall M-91 facility was reduced by 15% (from ~$80M to ~$67M in the FY08 to FY12 planning window) to account for the reduced scope of the RH—only processing capability/modules needed at T Plant.

Appendix E—Accelerated M-91 Cost Evaluation

Table E.1. Cost Savings Summary

Summary Costs ($M)

PBS #	Scope	Ctl Acct	RL-WBS	CAPN	CACN	TL 04-06	TL 07-35	Lifecycle TL	Contract FY04	Contract FY05	Contract FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35
RL-0013	T-Plant Upgrades	4.2.4.1	Total	Unescalated	0.0	3.4	16.9	20.2	0.8	2.1	0.5	5.3	0.6	4.0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	T-Plant Ops					35.5	150.0	185.5	12.0	11.5	12.0	16.1	12.0	12.0	10.0	10.0	10.0	9.3	9.3	9.3	9.3	9.3	9.3	9.3	7.4	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RL-0013	M-91 Facility - Construction	4.2.4.3	Total	Unescalated	0.0	2.0	69.3	71.3	0.0	0.8	1.2	2.5	11.8	22.7	22.3	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M-91 Facility - Ops					4.4	79.6	83.9	0.0	1.7	2.6	11.4	11.5	11.6	11.6	1.0	4.2	4.0	4.2	4.0	4.0	4.2	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RL-0013	In-Trench /Off-site M-91 Waste Processing	0.0	Total	Unescalated	0.0	0.7	8.3	9.0	0.0	0.0	0.7	1.9	1.9	1.9	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RL-0013	Non-Thermal/Thermal Treatment	4.2.10	Total	Unescalated	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total					45.9	324.0	369.9	12.8	16.1	17.0	37.2	37.8	52.2	46.5	21.7	14.8	13.9	14.1	13.9	13.9	14.1	13.9	13.9	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Annual Savings					(3.2)	128.1	124.9	0.0	(1.3)	(1.9)	(8.1)	(7.8)	(7.7)	(5.5)	11.6	6.9	4.6	4.5	4.8	4.7	4.4	4.5	4.6	9.7	9.7	17.7	17.7	17.7	18.2	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Cummulative Savings								0.0	(1.3)	(3.2)	(11.3)	(19.1)	(26.8)	(32.3)	(20.7)	(13.8)	(9.3)	(4.7)	(0.1)	(4.8)	9.1	13.7	18.2	27.9	37.6	53.3	73.0	90.7	108.9	116.9	124.9	124.9	124.9	124.9	124.9	124.9	124.9	124.9	124.9

Table E.2. Proposed M-91 Accelerated Processing Approach

Detailed Costs ($K)

T-Plant Costs																																								
RL-0013	T-Plant Min Safe	4.2.4.1	4.2.4.1.1	W24111	118803	35,503.7	239,240.9	274,744.6	12,009.8	11,509.3	11,984.6	16,093.2	11,985.4	11,984.6	11,984.7	11,984.7	11,985.0	11,307.1	11,307.2	11,306.6	11,306.9	11,307.1	11,306.6	11,306.9	11,307.2	11,306.8	11,307.1	11,306.8	11,307.1	11,627.3	7,956.2	7,956.6	0.0	0.0	0.0					
RL-0013	T-Plant CENRTC	4.2.4.1	4.2.4.1.2	W24121		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
RL-0013	T-Plant Upgrades	4.2.4.1	4.2.4.1.3	W24131	118804	994.4	18,372.7	19,367.1	578.1	0.0	416.3	5,233.6	562.8	3,970.4	562.8	562.8	562.8	531.0	531.0	531.0	531.0	531.0	531.0	531.0	531.0	531.0	531.0	531.0	531.0	546.0	0.0	0.0	0.0	0.0	0.0					
RL-0013	W-536 T-Plant Roof	4.2.4.1	4.2.4.1.4	W24141		2,036.5	0.0	2,036.5	0.0	2,036.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
RL-0013	W533 T-Plant Fans	4.2.4.1	4.2.4.1.5	W24151	118997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
RL-0013	T-Plant NESHAPS	4.2.4.1	4.2.4.1.6	W24161	119429	331.6	862.8	1,194.4	250.0	40.9	40.7	40.8	40.7	41.5	41.4	41.3	41.2	41.0	40.8	41.4	41.2	40.9	41.4	41.1	40.9	41.2	40.9	41.2	40.9	40.5	41.3	40.9	0.0	0.0	0.0					
RL-0013	T-Plant Early Closure					0.0	(71,609.0)	(71,609.0)																	(3,882.0)	(3,881.2)	(11,879.0)	(11,879.0)	(11,879.0)	(12,213.8)	(7,997.5)	(7,997.5)								
RL-0013	T-Plant Min Safe Cost reduction due to M-91 upgrades/Ops					0.0	(20,000.0)	(20,000.0)							(2000.0)	(2000.0)	(2000.0)	(2000.0)	(2000.0)	(2000.0)	(2000.0)	(2000.0)	(2000.0)	(2000.0)																
RL-0013	T-Plant	4.2.4.1	Total	Unescalated		38,866.1	166,867.4	205,733.6	12,837.9	13,586.7	12,441.6	21,367.6	12,588.9	15,996.5	10,588.9	10,588.8	10,588.9	9,879.0	9,879.0	9,879.0	9,879.0	9,879.0	9,879.0	9,879.0	7,997.0	7,997.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M-91 Costs																																								
RL-0013	Develop M-91 Facility (Expense/Cap)	4.2.4.3	4.2.4.3.1-2	W24311-21		1,972.3	163,619.7	165,592.0	$ -	$799	$1,173	$2,488	$11,811	$22,673	$22,317	$20,114	$8,478	$5,813	$5,814	$5,813	$5,813	$5,813	$5,813	$5,813	$5,813	$5,813	$5,813	$5,813	$5,813	$5,978	$ -	$ -	$ -	$ -	$ -					
RL-0013	Elimination of M-91 Facility					(1,972.3)	(163,619.7)	(165,592.0)		$(799)	$(1,173)	$(2,488)	$(11,811)	$(22,673)	$(22,317)	$(20,114)	$(8,478)	$(5,813)	$(5,814)	$(5,813)	$(5,813)	$(5,813)	$(5,813)	$(5,813)	$(5,813)	$(5,813)	$(5,813)	$(5,813)	$(5,813)	$(5,978)										
RL-0013	Project Management Costs									$799	$1,173	$2,488																												
RL-0013	Engineering Study for CH Processing					0.0	0.0	0.0																																
RL-0013	Engineering Study for RH Processing					0.0	0.0	0.0																																
RL-0013	Commercial RH Treat Option					0.0	0.0	0.0																																
RL-0013	Obtain Regulator Approval for In-Trench Treatment					0.0	0.0	0.0		0																														
RL-0013	Expand Contracts					0.0	0.0	0.0		0																														
RL-0013	Upgrades to T-Plant for Repackaging of oversize Pkgs (MLLW/TRU)					0.0	0.0	0.0			$ -																													
RL-0013	CH-MLLW Repackaging					561.5	7,334.0	7,895.5		$214	$347	$1,560	$1,740	$1,830	$1,930	$276																								
RL-0013						623.9	8,148.9	8,772.8		$238	$386	$1,733	$1,933	$2,033	$2,144	$306																								
RL-0013	CH-TRU Repackaging					3,168.1	32,104.9	35,273.0		$1,283	$1,888	$8,090	$7,823	$7,689	$7,541	$471	$164	$ -	$164	$ -	$ -	$164																		
RL-0013	Upgrades to T-Plant for Treatment of RH (MLLW/TRU)					0.0	66,800.4	66,800.4					$11,811	$22,673	$22,317	$10,000																								
RL-0013	RH-MLLW Treatment					0.0	6,236.6	6,236.6							-	-	$537	$750	$889	$998	$853	$735	$717	$756																
RL-0013	RH-TRU Treatment					0.0	25,763.4	25,763.4							-	-	$3,463	$3,250	$3,111	$3,002	$3,147	$3,265	$3,283	$3,244																
RL-0013	Develop M-91 Facility	4.2.4.3	Total	Unescalated		6,325.8	148,876.7	155,202.5	0.0	2,533.8	3,792.0	13,870.3	23,306.4	34,224.7	33,931.4	11,053.2	4,163.5	4,000.0	4,163.5	4,000.0	4,000.0	4,163.5	4,000.0	4,000.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
In-Trench /Off-site M-91 Waste Processing																																								
	In-Trench Treatment					0.0	5,200.7	5,200.7				1207.0	$1,207	$1,207	$1,207	$37	$37	$37	$37	$37	$37	$37	$37	$37	$37															
	Packageing and Off-site Treatment costs					731.8	3,051.4	3,783.2			$732	$732	$732	$732	$732	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12															
RL-0013	In-Trench /Off-site M-91 Waste Processing		Total	Unescalated		731.8	8,252.1	8,983.9	0.0	0.0	731.8	1,938.8	1,938.9	1,938.8	1,938.8	49.7	49.7	49.7	49.7	49.7	49.7	49.7	49.7	49.7	49.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MLLW Treatment																																								
RL-0013	Non-Thermal Treatment	4.2.10	4.2.10.1	W21011	118785	6,398.0	134,250.8	140,648.8	3,407.2	2,651.7	339.1	4,107.5	4,108.7	4,107.7	4,107.7	4,108.0	7,355.9	7,746.4	7,633.4	8,099.4	8,189.4	8,493.4	7,859.4	6,079.4	5,798.4	5,959.4	5,500.4	6,035.4	3,498.4	3,937.5	4,672.5	4,353.5	4,346.5	2,104.0	2,019.0	2,022.0	2,008.0			
RL-0013	Thermal Treatment	4.2.10	4.2.10.2	W21021	118786	10,535.3	5,135.5	15,670.8	0.0	6,210.2	4,325.1	1,027.4	1,026.9	1,026.9	1,027.5	1,026.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
RL-0013	183-H Waste Disposal	4.2.10	4.2.10.3	W21031	119425	4,611.9	0.0	4,611.9	2,084.7	2,527.2																														
RL-0013	Administrative Order (M-91)	4.2.10	4.2.10.4	W21041	119987	9,299.4	103,250.4	112,549.8	1,317.0	3,844.7	4,137.6	35,129.0	34,229.3	28,926.3	2,593.7	2,372.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
RL-0014	M-91 Treatment of MLLW									(452.3)	(733.1)	(3,292.3)	(3,672.3)	(3,862.6)	(4,073.6)	(582.1)	(537.0)	(750.4)	(889.4)	(998.5)	(852.6)	(735.1)	(717.3)	(756.3)																
RL-0015	In-Trench and Off site MLLW Treatment Costs										(731.8)	(1,938.8)	(1,938.8)	(1,938.8)	(1,938.8)	(49.7)	(49.7)	(49.7)	(49.7)	(49.7)	(49.7)	(49.7)	(49.7)	(49.7)	(49.7)															
RL-0013	Non-Thermal/Thermal Treatment	4.2.10	Total	Unescalated		28,927.4	212,665.0	241,592.4	6,808.9	14,781.5	7,337.0	35,032.8	33,753.9	28,259.5	(1,716.5	6,875.1	6,769.2	6,946.3	6,694.2	7,051.2	7,287.1	7,708.6	7,092.3	5,273.4	5,748.7	5,959.4	5,500.4	6,035.4	3,498.4	3,937.5	4,672.5	4,353.5	4,346.5	2,104.0	2,019.0	2,022.0	2,008.0	0.0	0.0	0.0
RL-0013	Non-Thermal/Thermal Treatment	4.2.10	Total	Unescalated		1,917.2	29,971.7	31,888.8	0.0	452.3	1,464.9	5,231.1	5,611.1	5,801.4	6,012.4	631.8	586.7	800.1	939.1	1,048.2	902.3	784.8	767.0	806.0	49.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3. Processing Rate Assumptions

Annual Waste Processing Rates (m^3)

	Processing Cost ($K)	Unit Cost	Total Vol	TL 04-06	TL 07-35	Lifecycle TL	FY04	FY05	FY06	FY07 (m³)	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21
In-Trench Treatment																								
Waste Volume for In-Trench Treatment		**k$/m³**	**m³**																					
CH	$4,679	4	**1,170**	0.0	1,169.7	1,169.7				292.4	292.4	292.4	292.4											
RH	$522	7	**75**	0.0	74.5	74.5				5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	
Off-site Treatment																								
Waste Volume for Off-site Treatment Treatment		**k$/m3**	**m3**																					
CH MLLW/Macro Encapsulation	$1,842	7	**263**	52.6	210.5	263.2			52.6	52.6	52.6	52.6	52.6											
CH MLLW/Thermal Treatment	$1,755	60	**29**	5.8	23.4	29.2			5.8	5.8	5.8	5.8	5.8											
RH	$186	10	**19**	1.2	17.4	18.6			1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	
Oversized CH-MLLW/CH-TRU Waste Repackaging and Treat (90/10)																								
Waste Volume for Oversized CH Repackaging			k$/m3	m3																				
CH MLLW/Macro Encapsulation	$7,896		6	**1,316**	93.6	1,222.3	1,315.9		35.7	57.9	259.9	289.9	304.9	321.6	46									
CH MLLW/Thermal Treatment	$8,773		60	**146**	10.4	135.8	146.2		4.0	6.4	28.9	32.2	33.9	35.7	5.1									
CH-TRU (Oversized Non-Trench/non-offsite) Repack only)	$35,273		8	**4,409**	396.0	4,013.1	4,409.1		160.3	235.7	1,011.2	977.9	961.2	942.7	58.9	20.4	0	20.4	0	0	20.4			
RH-MLLW/RH-TRU Treatment/Processing																								
Remote Handled M-(1 Wastes			k$/m3	m3																				
RH-MLLW (Non-Trench/non-offsite)	$6,237		80	**93**	0.0	93.3	93.3						-	-	6.7	9.4	11.1	12.5	10.7	9.2	9.0	9.5	10.5	4.9
RH-TRU (Non-Trench/non-offsite)	$25,763		80	**365**	0.0	365.4	365.4						-	-	43.3	40.6	38.9	37.5	39.3	40.8	41.0	40.5	39.5	3.9
$105,756																								

Table E.4. Adjusted December 2003 Baseline Costs

Summary Costs ($M)

PBS #	Scope	Ctl Acct	RL-WBS	CAPN	CACN	TL 04-06	TL 07-35	Lifecycle TL	FY04 (Contract)	FY05 (Contract)	FY06 (Contract)	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35
RL-0013	T-Plant Upgrades	4.2.4.1	Total	Unescalated		3.4	19.2	22.6	0.8	2.1	0.5	5.3	0.6	4.0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	T-Plant Ops					35.5	239.2	274.7	12.0	11.5	12.0	16.1	12.0	12.0	12.0	12.0	12.0	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.6	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RL-0013	M-91 Facility - Construction	4.2.4.3	Total	Unescalated		2.0	79.4	81.4	0.0	0.8	1.2	2.5	11.8	22.7	22.3	20.1																								
	M-91 Facility - Ops					0.0	84.2	84.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.5	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				Escalated		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RL-0013	Offsetting MLLW Planned Treatment Costs	4.2.10	Total	Unescalated		0.0	30.0	30.0	0.0	0.0	0.0	5.2	5.6	5.8	6.0	0.6	0.6	0.8	0.9	1.0	0.9	0.8	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total					40.8	452.1	492.9	12.8	14.4	13.6	29.1	30.0	44.5	40.9	33.3	21.7	18.5	18.6	18.7	18.6	18.5	18.5	18.5	17.7	17.7	17.7	17.7	17.7	18.2	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Detailed Costs ($K)

PBS #	Scope	Ctl Acct	RL-WBS	CAPN	CACN	TL 04-06	TL 07-35	Lifecycle TL	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35
T-Plant Costs																																								
RL-0013	T-Plant Min Safe	4.2.4.1	4.2.4.1.1	W24111	118803	35,503.7	239,240.9	274,744.6	12,009.8	11,509.3	11,984.6	16,093.2	11,985.4	11,984.6	11,984.7	11,984.7	11,985.0	11,307.1	11,307.2	11,306.6	11,306.9	11,307.1	11,306.6	11,306.9	11,307.2	11,306.8	11,307.1	11,306.8	11,307.1	11,627.3	7,956.2	7,956.6	0.0	0.0	0.0					
RL-0013	T-Plant CENRTC	4.2.4.1	4.2.4.1.2	W24121		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
RL-0013	T-Plant Upgrades	4.2.4.1	4.2.4.1.3	W24131	118804	994.4	18,372.7	19,367.1	578.1	0.0	416.3	5,233.6	562.8	3,970.4	562.8	562.8	562.8	531.0	531.0	531.0	531.0	531.0	531.0	531.0	531.0	531.0	531.0	531.0	531.0	546.0	0.0	0.0	0.0	0.0	0.0					
RL-0013	W-536 T-Plant Roof	4.2.4.1	4.2.4.1.4	W24141		2,036.5	0.0	2,036.5	0.0	2,036.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
RL-0013	W533 T-Plant Fans	4.2.4.1	4.2.4.1.5	W24151	118997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
RL-0013	T-Plant NESHAPS	4.2.4.1	4.2.4.1.6	W24161	119429	331.6	862.8	1,194.4	250.0	40.9	40.7	40.8	40.7	41.5	41.4	41.3	41.2	41.0	40.8	41.4	41.2	40.9	41.4	41.1	40.9	41.2	40.9	41.2	40.9	40.5	41.3	40.9	0.0	0.0	0.0					
RL-0013	T-Plant	4.2.4.1	Total	Unescalated		38,866.1	258,476.4	297,342.5	12,837.9	13,586.7	12,441.6	21,367.6	12,588.9	15,996.5	12,588.9	12,588.8	12,588.9	11,879.0	11,879.0	11,879.0	11,879.0	11,879.0	11,879.0	11,879.0	11,879.0	11,879.0	11,879.0	11,879.0	11,879.0	12,213.8	7,997.5	7,997.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RL-0013	T-Plant	4.2.4.1	Total	Escalated		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M-91 Costs																																								
RL-0013	Develop M-91 Facility (Expense/Cap)	4.2.4.3	4.2.4.3.1-2	W24311-21		1,972.3	163,619.7	165,592.0	0.0	798.9	1,173.4	2,488.4	11,811.2	22,672.7	22,316.5	20,113.9	8,477.5	5,813.4	5,813.7	5,813.4	5,813.4	5,813.4	5,813.4	5,813.4	5,813.4	5,813.4	5,813.4	5,813.4	5,813.5	5,978.2	0.0	0.0	0.0	0.0	0.0					
RL-0013	Develop M-91 Facility	4.2.4.3	Total	Unescalated		1,972.3	163,619.7	165,592.0	0.0	798.9	1,173.4	2,488.4	11,811.2	22,672.7	22,316.5	20,113.9	8,477.5	5,813.4	5,813.7	5,813.4	5,813.4	5,813.4	5,813.4	5,813.4	5,813.4	5,813.4	5,813.4	5,813.4	5,813.5	5,978.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RL-0013	Develop M-91 Facility	4.2.4.3	Total	Escalated		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MLLW Treatment																																								
RL-0013	Non-Thermal Treatment	4.2.10	4.2.10.1	W21011	118785	6,398.0	134,250.8	140,648.8	3,407.2	2,651.7	339.1	4,107.5	4,108.7	4,107.7	4,107.7	4,108.0	7,355.9	7,746.4	7,633.4	8,099.4	8,189.4	8,493.4	7,859.4	6,079.4	5,798.4	5,959.4	5,500.4	6,035.4	3,498.4	3,937.5	4,672.5	4,353.5	4,346.5	2,104.0	2,019.0	2,022.0	2,008.0			
RL-0013	Thermal Treatment	4.2.10	4.2.10.2	W21021	118786	10,535.3	5,135.5	15,670.8	0.0	6,210.2	4,325.1	1,027.4	1,026.9	1,026.9	1,027.5	1,026.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
RL-0013	183-H Waste Disposal	4.2.10	4.2.10.3	W21031	119425	4,611.9	0.0	4,611.9	2,084.7	2,527.2																														
RL-0013	Administrative Order (M-91)	4.2.10	4.2.10.4	W21041	119987	9,299.4	103,250.4	112,549.8	1,317.0	3,844.7	4,137.6	35,129.0	34,229.3	28,926.3	2,593.7	2,372.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
RL-0013	M-91 MLLW Treatment Costs					0.0	(29,971.7)	(29,971.7)	0.0	0.0	0.0	(5,231.1)	(5,611.1)	(5,801.4)	(6,012.4)	(631.8)	(586.7)	(800.1)	(939.1)	(1,048.2)	(902.3)	(784.8)	(767.0)	(806.0)	(49.7)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RL-0013	M-91 MLLW Treatment Costs					0.0	29,971.7	29,971.7	0.0	0.0	0.0	5,231.1	5,611.1	5,801.4	6,012.4	631.8	586.7	800.1	939.1	1,048.2	902.3	784.8	767.0	806.0	49.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RL-0013	Non-Thermal/Thermal Treatment	4.2.10	TOTAL	Unescalated		30,844.6	242,636.7	273,481.2	6,808.9	15,233.8	8,801.8	40,263.9	39,364.9	34,060.9	7,728.9	7,506.9	7,355.9	7,746.4	7,633.4	8,099.4	8,189.4	8,493.4	7,859.4	6,079.4	5,798.4	5,959.4	5,500.4	6,035.4	3,498.4	3,937.5	4,672.5	4,353.5	4,346.5	2,104.0	2,019.0	2,022.0	2,008.0	0.0	0.0	0.0
RL-0013	Non-Thermal/Thermal Treatment	4.2.10	TOTAL	Escalated		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RL-0013	M-91 MLLW Treatment Costs	4.2.10	TOTAL	Unescalated		0.0	29,971.7	29,971.7	0.0	0.0	0.0	5,231.1	5,611.1	5,801.4	6,012.4	631.8	586.7	800.1	939.1	1,048.2	902.3	784.8	767.0	806.0	49.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Distribution List

Fluor Hanford, Inc.

Roberta Barcot	H8-44
Rick Dunn	T4-10
Lori Fritz (10)	H8-44
Jeff Jens	T4-04
Dave Levinskas	T3-28
Kent McDonald	T4-10
Dale McKenney	H8-44
Dean Nester	T4-05
Ken Quigley	H8-44
Virginia Rohay	E6-35
Dick Wilde	H8-44
Robert Wilkinson	T3-28

PNNL

Tom DeForest (2)	K7-97
Linda Fassbender	K7-97
Mark Hevland	K7-97
Wayne Johnson (5)	K7-97
Brian Parker	K7-97
Dave Payson	K7-90
Paul Scott	K9-46
Diana Shankle	K9-18
Mike Shay	K6-04
Kelli Templeton	K7-94
Terry Walton	K9-46