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Hanford Tank Waste to WIPP - Maximizing the Value of our National Repository Asset - 14230

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
Office of River Protection under Contract DE-AC27-08RV14800

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Hanford Tank Waste to WIPP – Maximizing the Value of our National Repository Asset - 14230

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ABSTRACT

Preplanning scope for the Hanford tank transuranic (TRU) waste project was authorized in 2013 by the Department of Energy (DOE) Office of River Protection (ORP) after a project standby period of eight years. Significant changes in DOE orders, Hanford contracts, and requirements at the Waste Isolation Pilot Plant (WIPP) have occurred during this time period, in addition to newly implemented regulatory permitting, re-evaluated waste management strategies, and new commercial applications. Preplanning has identified the following key approaches for reactivating the project: qualification of tank inventory designations and completion of all environmental regulatory permitting; identifying program options to accelerate retrieval of key leaking tank T-111; planning fully compliant implementation of DOE Order 413.3B [1], and DOE Standard 1189 [2] for potential on-site treatment; and re-evaluation of commercial retrieval and treatment technologies for better strategic bundling of permanent waste disposal options.

INTRODUCTION

Project Origination

A project was initiated in 2002 to disposition select Hanford tank waste to the WIPP. Waste would be retrieved through standard tank farm vacuum and sluicing technologies, treated to remove a majority of the liquid, packaged in WIPP-compliant containers, and certified and loaded for shipment to WIPP. The purpose of this project was to accelerate Hanford site cleanup per a contractor/ORP agreement, *Integrated Mission Acceleration Plan* (IMAP) [3]. This waste, prior to its detailed evaluation as TRU, was slated for processing in the Hanford Waste Treatment and Immobilization Plant (WTP) [4].

Project Scope

The project was defined to disposition both types of TRU: contact-handled (CH-TRU) and remote-handled (RH-TRU). A project was initiated first to retrieve, treat, and package CH-TRU, and then a second project would be implemented to disposition RH-TRU material, to take advantage of lessons learned and enable WIPP to finalize permitting and protocols for handling RH-TRU.

The CH-TRU project was organized into three sub-projects to facilitate different procurement strategies derived from IMAP planning. These three subprojects were:

1. Retrieval – using standard tank farm water sluicing and vacuum lances, followed by transport of liquefied sludge through above-ground hose-in-hose transfer lines; to be designed and operated by tank farms personnel using fabrication subcontracts

2. Treatment/Packaging – using vacuum dryer dewatering technology in a modular/mobile system to disposition water in the sludge stream from Retrieval; managed through a fast-track design/build procurement contract from a competitive bid process; to be operated by tank farms personnel (first operating at B-farm then moved to T-farm)
3. Characterization, Storage, and Shipping (CSS) – using WIPP-supplied Central Characterization Project (CCP) support to stage, assay, and package the final treated sludge; to be managed through multiple tank farm contractor contracts, operated by CCP and tank farms personnel.

Waste Inventory

Approximately 5,300 m^3 (1.4M gallons) of tanks sludges were identified in the original project, on the basis of origin and species concentration, as potential CH-TRU material, and 5,700 m^3 (1.5 million gallons [Mgal]) as RH-TRU. While this is a small percentage of the total 212,000 m^3 (56 Mgal) waste volume at Hanford (comprised of sludge saltcake, and supernate) it represents a larger segment of the total sludge volume subset: over 25% of the 42,000 m^3 (11 Mgal) of sludge [5]. Volumes are listed in Table I.

Table I. Original Project TRU Tank Inventory

CH-TRU In-tank Sludge Inventory			RH-TRU In-tank Sludge Inventory		
Tank	**(m^3)**	**(kgal)**	**Tank**	**(m^3)**	**(kgal)**
B-201	110	29	B-107	326	86
B-202	106	28	B-110	924	244
B-203	189	50	B-111	912	241
B-204	189	50	T-105	371	98
T-201	114	30	T-107	655	173
T-202	76	20	T-112	227	60
T-203	136	36	AW-103	1,033	273
T-204	136	36	AW-105	996	263
T-104	1,401	370	SY-102	269	71
T-110	1,692	447			
T-111	1,200	317			
CH-TRU Subtotal	5,349	1,413	RH-TRU Subtotal	5,713	1,509

The waste tanks containing the TRU sludges are located in two single-shell tank (SST) farms, B and T, and two double-shell tank (DST) farms, AW and SY. The tank farms' physical location on the Hanford 200 areas plateau is shown in Figure 1. The CH-TRU sludge material is located within eight 200-series tanks of a 208 m^3 (55,000 gallons) capacity, and three 100-series tanks of a 2,006 m^3 (530,000 gallons) capacity. RH-TRU sludges are located in these same farms in 100-series tanks and in three DSTs of 3,785 m^3 (1 Mgal) capacity.

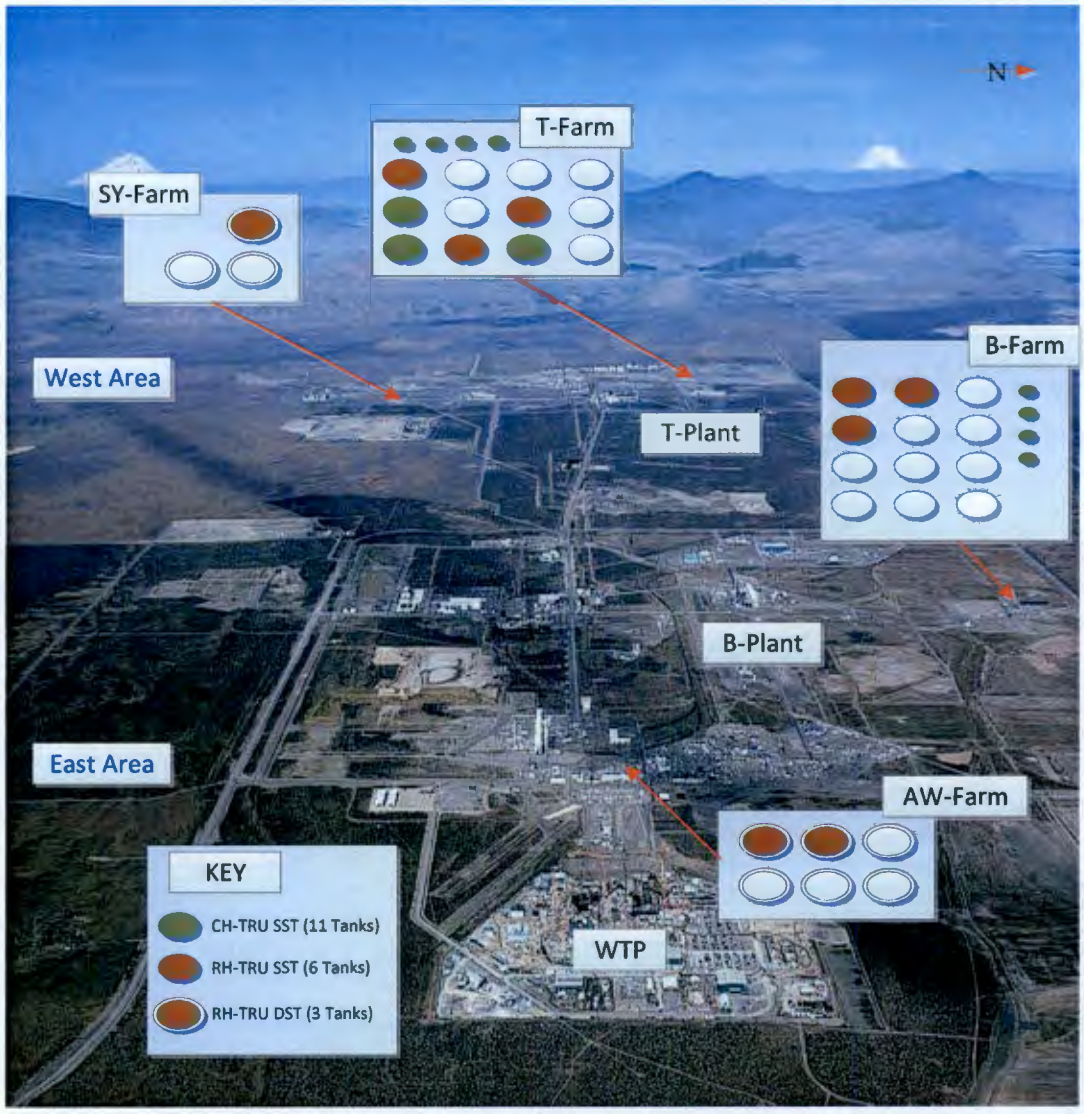

Fig. 1. Hanford TRU Tanks Plan View on the 200 Area Plateau.

Figure 2 highlights the challenging conditions for waste disposition. First, the tank farms with TRU waste are widely separated. The earlier project envisioned multiple retrieval systems and two treatment/packaging systems for CH-TRU - one each at B-farm and T-farm. The final treatment system design/build contract resulted in a single mobile/modular system to be transported between B/T-farms. This removed the cost of two treatment systems but established new risks for design, build, and testing of mobile systems and new risks for decontaminating and relocating radioactive processing equipment. Pumping retrieved sludges to a central treatment system was not considered practical because there are no active underground transport lines available at B/T farms connecting to the DST system (which maintains active infrastructure and transfer lines). Distances are also so great that intermediate booster pumping/tankage would be needed to get the waste to the DST farms for above-ground temporary piping. Second, the B/T farm locations have minimal to no infrastructure (ventilation, power, water, etc.) because of their

remote locations, and out-of-service condition. Lastly, the three different sizes and types of tanks may require widely different retrieval methodologies.

Waste Chemistry

All of the CH-TRU waste and the majority of the RH-TRU waste originated from the Bismuth-Phosphate fuel separations process during the earliest years of Hanford operation. Three basic batch unit operations occurred in processing the spent fuel for defense material: cladding removal; spent fuel reprocessing where the plutonium was separated from the other spent fuel constituents including fission products; and downstream plutonium decontamination operations to prepare the plutonium as a final product for its defense applications. The waste streams in the TRU sludge tanks came from cladding removal operations and the plutonium decontamination operations occurring in B and T Plants and their respective recovery facilities. The processing steps and basis for waste designation are summarized in the DOE-ORP document, *Basis for Designating Certain Hanford Single-Shell Tank Wastes Resulting from the Bismuth-Phosphate process as TRU* [6].

The waste sludges obviously contain high concentrations of bismuth and phosphate chemicals, in addition to nitrates from acid dissolutions, and caustic from waste neutralization prior to discharge to the tanks. They contain relatively low concentrations of fission products compared to high-level waste (HLW), but sufficient transuranic isotopes for final packaged material that meets WIPP waste acceptance criteria.

Because the waste was generated in batches from different unit operations of the plant, waste physical properties vary between tanks and even within tanks. For example, core samples have indicated a variety of moisture concentrations. Tank T-110 averaged 19% water [7] while T-111 has a moisture content of 68-75% [8]. Core 180 Segment from the T-110 bottom was described as "dry sludge" while Segment 4 (middle) was described as "wet slurry" [7]. Normally you would expect to find more moisture on the bottom as depicted from T-111 cores: Core 31 Segment 9 (bottom) was described as "swamp mud" while Segment 1 (top) from the same Core was described as "viscous solids" [8].

Project Value

Retrieval of this SST waste for WIPP disposal removes a risk to the environment by early retrieval of tank waste. The unique tank chemistry and infrastructure needs result in the retrieval of these tanks at the end of the Hanford mission, should they be processed through the WTP [9]. Intermediate tankage, piping, and transfer pump systems would need to be installed (in addition to the normal tank retrieval systems) in order to pump the retrieved sludges to the DST system and eventual WTP feed tanks. Sludges in West Area will require cross-site transfer to the East Area for WTP feed, and the related extra liquid needed to ensure the transfers do not settle out and plug will need to be stored and evaporated. The current chemical constituents of this sludge require blending with other non-bismuth-phosphate derived streams to maximize waste loading in the WTP melters. Dispositioning these wastes instead to WIPP does not require the infrastructure to get the waste to the DST system nor any unique blending for glass formulations.

This early retrieval means that the results of current tank leakages are reduced by decades, and the risk of new tank leakages occurring is minimized.

This waste is also poised to be the first bulk tank waste dispositioned to WIPP. Successful removal of the hurdles to allow disposition of this waste to WIPP will pave the way for other DOE-complex TRU streams to be disposed of at the nation's only deep geologic disposal site.

If designated as non-HLW there are only has two disposition paths depending upon radionuclide concentration: TRU or low-level waste [9]. Low-level waste would be disposed of at a licensed surface facility; however the TRU path places this tank waste in a deep geologic repository – a much more protective location to future generations from the long-lived isotopes.

Lastly, dispositioning 5,300 m^3 (1.4M gallons) of CH-TRU waste to WIPP avoids processing this material in the Hanford WTP, which saves the operating costs of generating approximately 900 additional low activity waste (LAW) glass canisters and 900 additional HLW glass canisters. This lifecycle cost savings from avoiding WTP processing is $1.7 billion [10]. An overall DOE lifecycle savings would be much higher from the lower costs to package, ship, and load the TRU into WIPP versus final certification, shipment, and loading into the HLW repository. Dispositioning RH-TRU to WIPP would have similar additional savings, because its current identified volume is equal to that of CH-TRU.

Project Status

The following bullets detail the major project activities leading up to recent 2012/2013 preplanning scope.

2002
- Supplemental treatment options evaluated for accelerating mission through Cleanup Constraints and Challenges (C3T) process
- DOE/ORP prepares Management Plan for acceleration of Hanford cleanup [11]

2003
- Review of historical records completed and "Origin of Waste" evaluations completed for CH-TRU tanks [12], [13], [14], and initial RH-TRU tank [15]
- IMAP issued and signed by contractor and DOE-ORP [3]
- Design/build contract issued for Treatment/Packaging System
- Treatment/Packaging System Part B and EIS documents completed

2004
- Long-lead procurements initiated – majority received
- TRU Project slowed to address environmental permitting issues
- Review of historical records completed and "Origin of Waste" evaluations completed for RH-TRU tanks, and revisions issued for CH-TRU tank evaluations [16], [17], [18], [19], [20], [21], [22], & [23]
- DOE issues designation basis document Revision 0 for CH-TRU tanks [24]
- WIPP Part B amended to restrict all DOE tank waste unless confirmed through a Class III permit modification request (PMR)

2005
- TRU Project placed in Standby for 1-2 years to resolve environmental permitting (Final DOE designation, WIPP PMR, and EIS Record of Decision (ROD))
- TRU NEPA coverage redirected to the in-progress Final Tank Closure and Waste Management (TC & WM) EIS

2008
- RH-TRU removed from TRU EPA database and DOE/ORP baseline [25] because of DOE-ORP estimate that potential co-mingling with HLW may challenge designation basis

2009
- Project delayed to FY2014 start because of continued TC & WM EIS delay and no progress on WIPP Class III PMR

2011
- A Class III WIPP PMR was drafted to allow disposition of the eleven CH-TRU tanks to WIPP, but was not submitted to the New Mexico Environmental Department (NMED)

DISCUSSION

Significant progress was made in 2013 towards reactivating the CH-TRU project on project permitting and regulatory analysis, re-evaluation to DOE capital asset project requirements, and commercial opportunities and technology applications. Continuing the key timeline bullets provides the following dates and effort of DOE-specific actions.

2012
- DOE issues TC & WM EIS [26]
- CBFO initiates Class II PMR for removing the entire tank waste restriction

2013
- DOE issues notice of WIPP as preferred alternate in Federal Register as prelude to the ROD [27]
- DOE initiates integrated project team (IPT) to resolve designation issues and assigns DOE-ORP Federal Project Director
- DOE-ORP issues Revision 1 designation report [6]
- DOE-HQ prepares basis designation report and approves non-HLW designation for 7 of the 11 CH-TRU tanks (T-201 through 204, T-104, T-110 & T-111) [28]

This DOE effort was significant is moving the CH-TRU project forward. The work accomplished in 2012 – 2013 removed key environmental project hurdles. An additional issue surfaced in 2012 related to SST leakage that was an additional impetus for this DOE effort, and is discussed next.

Tank T-111 Leakage

Potential additional leakage of the CH-TRU tank T-111, and several other new CH-TRU tanks surfaced in late 2012. DOE-ORP's prior focus has been on completion of the vitrification plants (WTP) and steady SST waste retrievals as defined by the Tri-Party Agreement [29] and related 2010 Consent Decree [30]. Neither of these documents promulgates the shipment of tank TRU waste to WIPP. However, potential additional tank leakage of related CH-TRU tanks and their elevation as a public issue by the Secretary of Energy and Governor of the State of Washington [31] provided the impetus to begin resolution of CH-TRU waste disposal.

The standard tank farm SST integrity assessment program reviewed SST level records and identified suspicious level decreases in twenty SSTs. Five CH-TRU tanks were on this list: B-203, B-204, T-203, T-204, and T-111[32]. The integrity assessment recommended that these twenty tanks undergo additional analysis examining potential inflows and tank history. Informal evaluation suggested that many of these level decreases could be qualified as within the error

band of the level instrumentation and accountable by normal solids settling, however the level decrease from T-111 appeared to clearly infer additional tank leakage.

Tank leakage history for TRU tanks is depicted in Table II. As indicated in this table, T-111 has already been evaluated for additional tank leakage back in 1994. Initial saltwell pumping to remove free liquids occurred in 1990, but additional pumping was performed in late 1994 to remove additional liquid [8]. The T-111 tank was declared interim stabilized (free water removed to the extent practical) in February 1995 [33]. This tank remains a high risk for continued leakage.

Table II. TRU Tank Leakage Declaration History

TRU Tank	TRU Type	Assumed Leak Status Declared [5]	SSTs Recommended for Level Decrease Evaluation in 2013 [30]
B-107	RH	1980	---
B-110	RH	1978	---
B-111	RH	1978	---
B-201	CH	1980	---
B-203	CH	1983	X
B-204	CH	1984	X
T-107	RH	1984	---
T-111	CH	1979 – Assumed Leaker 1994 – Assumed re-leaker	X
T-203	CH	Not yet	X
T-204	CH	Not yet	X

Removal of T-111 contents has become a higher priority, thus bringing increased focus upon the CH-TRU project for retrieval mitigation. The following strategic options were identified to accelerate T-111 retrieval while maintaining viability for WIPP disposal. None of these strategies have been implemented but are continuing to be examined as project planning progresses.

1. Reactivation of the prior project baseline using standard sluicing and eductor/vacuum pumping (revising the retrieval sequence to first retrieve T-111) to a mobile/modular treatment system, that uses a commercial rotary vacuum dryer,
    a. Value: accelerates design process because of defined technology
    b. Challenges: fast-track with no alternative analysis or final technology development of the dryer system – not fully compliant with DOE Order 413.3B
2. Standard retrieval of T-111 only, to a new technology development treatment and packaging facility, evaluating various dewatering technologies

   a. Value: accelerates treatment system RCRA permitting through usage of Research, Development, and Demonstration permit instead of a Part B; also allows final technology development within criteria of DOE Order 413.3B
   b. Challenges: additional cost to convert or redo technology development system to a fully-compliant capital asset project operating within a RCRA Part B permit for remaining tanks
3. Standard retrieval of T-111 only to packaging system using added sorbent for dewatering
   a. Value: no permitted treatment system required
   b. Challenges: much larger number of WIPP packages; high risk for packages not assaying out as TRU
4. Standard retrieval with decanting followed by shipment to an off-site vendor for final dewatering and packaging
   a. Value: Treatment system permitting and design/construction responsibility of vendor, with greatly accelerated processes for both
   b. Challenges: Would still need to build a treatment system for decanting (including it being permitted under RCRA); need to qualify tank sludge transport system to vendor; and vendor costs may be appreciable once implementing contract flowdown requirements
5. Mechanical retrieval followed by shipment to an off-site vendor for final treatment and packaging
   a. Value: Same as number 4 with the addition of not having to design/build/permit a decanting facility
   b. Challenges: technology development of mechanical retrieval system and packaging/transport system needed in addition to same vendor challenges noted in number 4
6. Standard retrieval using modular evaporation for general concentration, and subsequent placement in new above-ground storage tanks awaiting final treatment/packaging system
   a. Value: Retrieval not dependent upon WIPP treatment and packaging operation; while staging tanks could be used for final packaging system
   b. Challenges: Additional cost for larger volume of storage; and should an evaporator be used to minimize storage it would need permitted
7. Mechanical retrieval directly into a WIPP container
   a. Value: No treatment system required; no additional liquid minimizes production of non-TRU packages
   b. Challenge: technology development of mechanical retrieval and subsequent packaging system; produces liquid waste needing transport to a DST

These 7 options support acceleration of T-111 waste retrieval. The value of this acceleration needs to be weighed against overall project cost and schedule, as well as compliance to DOE orders/standards and Stakeholder expectations. These and other options will be evaluated upon project reactivation for initiation of design.

Project Permitting and Regulatory Analysis

Central to the project delay and key for project continuation is the completion of the following environmental permitting documentation, primarily through the direct effort of DOE:

1. Removal of the tank waste restriction in the WIPP Part B permit
2. DOE designation that the tank waste is not HLW
3. Issuance of a ROD.

These three issues were unresolved with no clear immediate path forward back in 2005 resulting in DOE placing the project in standby mode. Significant effort was begun in these three areas by DOE in 2012 and 2013 for their resolution.

1. WIPP Waste restriction – A restriction was added in 2004 to the WIPP Part B permit that prohibited tank waste from Hanford, Savannah River, and Idaho National Laboratory from being disposed at WIPP unless formally accepted through a Class III PMR. The specific text from the WIPP Part B, Section 2.3.3.8 is noted below.

   > *TRU mixed waste that has ever been managed as high-level waste and waste from tanks specified in Permit Attachment C* [includes all waste tanks at Hanford] *are not acceptable at WIPP unless specifically approved through a Class 3 permit modification* [34].

   The Hanford project had drafted various versions of a Class III PMR in 2004 related to the eleven CH-TRU tanks. These were not submitted to NMED because DOE's highest priority for a Class III revision at that time was for disposal of RH-TRU. An updated Class III PMR was drafted in 2011 for the same tanks but was not submitted to NMED either; this time because new direction from NMED indicated they would prefer to address the tank waste issue more globally than to process multiple Class III PMRs for different tank sets.

   The DOE-Carlsbad Field Office (CBFO) in conjunction with the NMED then began processing a Class II PMR in 2012 to remove the complete Part B PMR tank waste restriction (for all DOE tanks), rather than just eliminate the restriction on the eleven Hanford CH-TRU tanks. This process had progressed through the completion of public meetings and receipt of public comments in 2013, with no significant challenge. However, in 2013, the NMED decided to revise the process to a Class III PMR change [35]. A Class III process revises the public meeting and comment resolution process to a more formal hearing which could result in extending the final resolution 1-2 more years. Elimination of the WIPP Part B restriction remains a key issue and its delay maintains a high risk for project continuation.

2. DOE designation – The DOE-HQ process for documenting the TRU waste designation moved significantly forward in 2013 through the completion of revised DOE-ORP designation basis document [6], and preparation of a DOE-HQ basis report [28]. These documents focused upon qualifying that the waste was not HLW, and could be

reasonably evaluated to be TRU after packaging. Actual formal certification that the waste is TRU must occur after final packaging, inspection, and assay, however, the waste designation allows the DOE to initiate project activities with less risk, and paves the way for a final ROD. The DOE-HQ report phased its tank application, with the first tank set being designated the seven CH-TRU tanks in T-farm (T-201 through 204, T-104, T-110, & T-111). It is expected that DOE will process a designation addendum or new basis report for the remaining four CH-TRU tanks in B-farm (B-201 through 204) in the near future. The DOE-ORP designation basis document [6] includes all 11 CH-TRU tanks in its analysis. These documents, and specifically the DOE-HQ report, have eliminated a major hurdle for implementing the CH-TRU project.

3. ROD issuance – The DOE-ORP had approved a Supplement Analysis [36] in 2003 to the 1996 Tank Waste Remediation System Environmental Impact Statement [37] as part of the original project. It had submitted this approved Supplement Analysis and draft ROD to DOE-HQ in December 2003 [38]. Litigation challenges occurring at the time, related to WIPP and HLW waste designation, delayed approval of the ROD. DOE decided in 2005 to revise its NEPA approach by combining the CH-TRU program under the new tank farm TC & WM EIS, currently in production and anticipated to be completed within two years. The TC & WM EIS was however significantly delayed.

   The TC & WM EIS was completed and issued in December 2012 [26]. DOE then began evaluating strategies for issuance of the final ROD(s). The TC&WM EIS qualified in the Cover section, page 3, the following clarification to its WIPP ROD strategy for Hanford TRU wastes:

   > *Although DOE previously expressed its preference that no Hanford tank waste would be shipped to the Waste Isolation Pilot Plant (WIPP) (74 FR 67189), DOE now prefers to consider the option to retrieve, treat, and package waste that may be properly and legally designated as mixed transuranic (TRU) waste from specific tanks for disposal at WIPP, as analyzed in Tank Closure Alternatives 3A, 3B, 3C, 4, and 5. Initiating retrieval of tank waste identified as mixed TRU waste would be contingent on DOE's obtaining the applicable disposal and other necessary permits and ensuring that the WIPP Waste Acceptance Criteria and all other applicable regulatory requirements have been met. Retrieval of tank waste identified as mixed TRU waste would commence only after DOE had issued a Federal Register notice of its preferred alternative and a ROD* [26].

   DOE is finalizing its ROD(s) with the completion of its designation basis, but at the time of this publication has not yet issued a ROD related to CH-TRU waste. Issuance of ROD remains a key NEPA issue and its delay maintains a high risk for project continuation.

DOE Capital Asset Project Requirements

The TRU project issued a revision to its overall program plan, *Transuranic Tank Waste Project Management Plan*, in 2013[39]. This plan updated the project's capital asset strategy while maintaining the three sub-project work breakdown structures, assuming implementation of on-site systems. A comparison of the previous project and future applications from this plan are shown in Table III.

Table III. TRU Sub-Project Capital Asset Planning

Sub-project	Prior Project Planning	Current 2013 Planning
Retrieval	Non-capital asset project	Non-capital asset project if standard sluicing and vacuum retrieval systems used; Possible new capital asset project for major revision to retrieval approach, e.g., new mechanical systems
Treatment/Packaging	Non-capital asset project	Capital asset project
CSS	Non-capital asset project	Non-capital asset project

Retrieval was qualified in 2003 by DOE-ORP as a non-capital asset project, i.e., it did not have to fully comply with DOE Order 413.3 in preparing and scheduling critical decision design packages, on the basis that retrieval was a normal expense-funded tank farm maintenance and operations activity [40]. This same strategy was applied to the treatment and packaging systems and CSS [41].

Current planning has changed the capital asset strategy, primarily because of the two major changes to DOE Order 413.3B since the original project: a new formal technology assessment and implementation program; and a revised safety-in-design program from DOE-STD-1189.

- Retrieval - Should the retrieval systems mirror the technology evaluated in 2003 then the same non-capital asset qualification will be applied. However, significant revisions to the technology approach, especially involving mechanical retrieval systems such as augers and screw conveyors, may drive these systems to be managed as capital assets. New approaches may require technology development and there might be significant changes to the tank farm safety basis. These two impacts, coupled with an estimation of the retrieval project > $20M and having a life of > 2 years could push new retrieval technologies into applying DOE Order 413.3B capital asset project requirements.

- Treatment and Packaging – The Waste Packaging System (WPS) that dewatered and packaged the CH-TRU sludges was originally envisioned to have a short lifespan and only involve simple dewatering, such as centrifugation. Two systems were planned: one a B-farm and the other at T-farm. It was therefore associated with the same retrieval operational category. The WPS technology approach however changed through the procurement process to involve a mobile system for both farms and used a low temperature high vacuum rotary dryer. The complexity of the final WPS approach could have easily supported a requalification as a capital asset project.

  New technology readiness and DOE-STD-1189 protocols within DOE Order 413.3B have established additional criteria for qualifying a capital asset project. Technology development requirements would be directly applicable to the final treatment system processing equipment, involving scale testing with simulants, and most probably a formal technology readiness assessment. A new treatment system would most probably involve processing equipment never used at Hanford and would thus introduce new hazards. It is assumed that these hazards and ensuing safety analysis changes would result in a DOE-

STD-1189 designation as a "major modification," thus requiring submittal of specific safety-in-design documentation to support DOE Order 413.3B critical decision packages,

As noted above, there are various options for resolving accelerating T-111 retrieval and treatment. Though a final selection may include off-site treatment, it is conservatively assumed that the WPS would be an on-site process, significantly affecting the existing tank farm safety basis, cost > $50M, and with a life of 5-10 years. The CH-TRU project plans to move forward with the assumption that the WPS will be a capital asset project even though the final strategic bundling of retrieval and technology treatment options has not been selected; the prior technology baseline is now only one option among many for dispositioning this waste.

- CSS – Hanford site contractual responsibilities were significantly revised with the new Plateau Remediation and Tank Farm contracts in 2008. Actual performance of CSS scope was transferred away from the tank farm contractor to the plateau remediation contractor, primarily with CCP support. The tank farm contractor will only perform initial characterization activities at the WPS while assembling the initial data packages. It will then provide pass-through funding to the plateau remediation contractor for remaining characterization, certification, staging, and loading of packages for shipping. This contractual approach is essentially a service-type operation and has no application as a capital asset project.

Commercial Opportunities and Technology Applications

The basic preplanning strategy for reactivating the CH-TRU project is that the earlier WPS technology approach needs revisited, especially with the assumption that the WPS is a capital asset project. DOE has also been informally approached by several firms in 2013 offering different technology approaches for dispositioning this waste. Accordingly, DOE-ORP chartered the tank farm contractor in 2013 to inquire and evaluate current commercial approaches for any or all three CH-TRU sub-projects.

The tank farm contractor issued a Request for Information (RFI) on both its external procurement web page and FedBizOpps.gov website in July, 2013 [42]. Fourteen expressions of interest (EOIs) were received from individual and teamed firms. Responses ranged from providing staff augmentation support to performing complete retrieval and treatment scope. Some unique technologies were identified such as mechanical auguring and freeze dredging for retrieval, and microwave and autoclave drying for treatment. Most responses were related to performing operations on site, but a response for total off-site commercial treatment and absorption was received.

These options, along with contractor-identified scenarios were documented with qualitative pros and cons assigned. The bounding proforma scenarios are listed in Table IV.

Table IV. EOI Bounding Scenarios

Group	No.	Technology Alternative	Description
Retrieval	R-1	Sluicing/Pumping	Sluicing with water addition to break up waste sediment and pumping to treatment system
	R-2	Sluicing/Vacuum	Sluicing to break up waste sediment and vacuum/pumping to treatment system
	R-3	Mechanical Retrieval Technologies	Dredge/auger or remote operated vehicle to convey or auger waste to treatment or container
	R-4	Waste Freezing	Freeze blocks of waste, transfer to treatment
	R-5	Chemical Reduction of Sludge	Mobilize waste using chemical addition to dissolve deposits and improve suspension and retrieve using pump
Treatment	T-1	Wiped Film Evaporator	Dewater using heated, continuous agitated thin film evaporation under vacuum.
	T-2	Microwave Drying	Dewater by drying using microwaves for inside-out drying
	T-3	Vacuum Drying	Dewater using vacuum and temperature
	T-4	Vertical Drying	Dewater using heated and mechanically actuated thin film vertical dryer
	T-5	Freeze Technology	Freeze and control thaw to dewater
	T-6	Mechanical - Filtration	Dewater solids using filter media
	T-7	Mechanical - Centrifuge	Dewater solids using centrifugal forces
	T-8	Mechanical - Pressing	Dewater using mechanical press to force waste through filter plates
	T-9	Decanting	Dewater solid using settling
	T-10	Vitrification	Solidify waste in glass matrix
	T-11	Onsite Absorption / Grouting	Dewatering through addition of an absorbent material (onsite)
	T-12	Offsite Dewatering / Absorption / Packaging	Dewatering through addition of an absorbent material (offsite)
	T-13	Autoclave In-Container Treatment	Dewatering by heating waste in containers
	T-14	Drum Dryer	Dewatering by heating waste in containers

Group	No.	Technology Alternative	Description
Packaging	P-1	55-gallon drum or SWB / TRUPACT II Cask	55-gal or SWB packaged and shipped to WIPP in TRUPACT II
	P-2	Std. Waste Box II / TRUPACT III Cask	SLB2 packaged and shipped to WIPP in TRUPACT III
CSS	C-1	Plateau Remediation Contractor (using 200 West Central Waste Complex facilities	CSS managed per current contracts
	C-2	Mobile characterization	CSS managed per packaging contractor
Onsite Transportation	O-1	LR-56 Style Tank Transporter	Suitable for Type B fluid waste
	O-2	Slurry Tote	Suitable for slurry waste
	O-3	Sludge Transport and Storage Canister	Suitable for RH sludge waste

These scenarios are undergoing continuing evaluation for strategic bundling to meet various project criteria. This work is chartered by the DOE-ORP. The on-site transportation options are being examined to relook at the establishment of a central treatment system. Instead of pumping the retrieved waste through new piping, tanks, booster pumps, and infrastructure it may be practical to transport sludges in a container using truck/trailers.

The scenarios will be eventually ranked and quantitatively evaluated in a Value-Engineering workshop. Then select approaches will have life-cycle cost evaluations performed to arrive at a final list and preferred conceptual design alternatives. This ranking and life-cycle analysis is part of DOE Order 413.3B conceptual design effort, and currently not chartered by the DOE-ORP.

CONCLUSIONS

The dispositioning of TRU tank waste from Hanford to WIPP provides significant value to the public and DOE. The recent effort performed by DOE on environmental regulatory issues and completion of preplanning scope by the tank farm contractor have advanced the CH-TRU project beyond the major hurdles of the last decade. The WIPP remains a national asset for the protection of people and the environment in mitigating the defense-related nuclear waste of our nation.

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