APPENDIX C

EXECUTIVE SUMMARY TANK ALTERNATIVE CLOSURE DEMONSTRATION PROJECT, ALTERNATIVE GENERATION & ANALYSIS

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RPP-12194 REV 0
(September 15, 2002)

EXECUTIVE SUMMARY

The purposes of this Alternatives Generation and Analysis (AGA) report are to evaluate the regulatory and technical alternatives for characterization, retrieval, and closure of the five tanks selected for the Accelerated Tank Closure Demonstration (ATCD) project, to assess the relationship between costs and benefits associated with waste retrieval to various possible end states, and to define the methodologies and approaches to be used for risk assessment. This report builds on information summarized in the *ATCD Data Assessment Report* (DAR) (Callison 2002), and supports finalization of preliminary engineering activities for waste retrieval and tank closure.

The ATCD approach is being implemented in a step-wise fashion to develop the technical basis for retrieval and closure of five single-shell tanks (SSTs) while working through the regulatory process and managing programmatic risk (Lee 2002).

Five tanks, all located within the C Tank Farm, were selected for demonstration of closure (the 241-C-106 tank and four 200 series tanks [241-C-201 through 241-C-204]). A complete description and background of C Tank Farm and the five selected tanks is found in the DAR. A brief summary of the tank capacities and current state as compared to the *Hanford Federal Facility Agreement and Consent Order* (HFFACO) retrieval goal is provided below:

Summary of Tank Capacity and Current State

Tank	Capacity L (gal)	Current Estimated Volume, L (gal)			Residual Volume Retrieval Goal [a] L (gal)
		Liquids	Solids	Total	
241-C-106	2,010,000 *(530,000)*	115,000(30,000)	23,000 (6,000)	138,000 (36,000)	10,219 (2,700)
241-C-201	208,000 *(55,000)*	None	4,000 (1,000)	4,000 (1,000)	852 (225)
241-C-202	208,000 *(55,000)*	None	4,000 (1,000)	4,000 (1,000)	852 (225)
241-C-203	208,000 *(55,000)*	None	10,000 (3,000)	10,000 (3,000)	852 (225)
241-C-204	208,000 *(55,000)*	None	10,000 (3,000)	10,000 (3,000)	852 (225)

[a] Based on HFFACO milestone *M-45.*

REGULATORY ALTERNATIVES

The regulatory strategy for the ATCD Project identifies an approach for obtaining the necessary approvals from the U.S. Department of Energy (DOE), Washington State Department of Ecology (Ecology), Washington State Department of Health (WDOH), and the Environmental Protection Agency for the proposed actions. The strategy focuses on addressing decisions associated with

the key regulatory requirements controlling tank waste retrieval and closure technology demonstrations.

The recommended strategy for compliance with the regulatory requirements is summarized by the following elements:

National Environmental Policy Act (NEPA) compliance with an Environmental Assessment and State Environmental Policy Act (SEPA) checklist.

Tier Hazardous Waste Management Act (HWMA)/(RCRA) Closure Plans for RCRA Permit Modifications and DOE Order 435.1 requirements.

Redesignating residual tank waste as waste incidental to reprocessing (WIR) in accordance with DOE Order 435.1.

Long- and short-term risk is evaluated through a detailed site-specific risk assessment based on conditions and knowledge of the C Tank Farm integrated with a site-wide composite analysis for a performance assessment.

Traditional in-tank characterization requires adjustments to support the ATCD accelerated schedule. Sampling techniques and a non-traditional characterization strategy are being evaluated in the data quality objectives. The strategy includes accelerating the analytical processing of the post-retrieval samples to support regulatory approval. It is assumed that residual wastes will have the same or very similar composition as pre-retrieval wastes.

COST-BENEFIT ANALYSIS

Selection of retrieval technologies and overall waste retrieval strategy must eventually consider factors other than retrieval technology capability. This need to consider other factors, including cost, is addressed in HFFACO Milestone M-45, Appendix H to the HFFACO, DOE Orders, and the 1996 Memorandum of Understanding agreed to by DOE and Ecology.

While we may lack the necessary understanding of the key elements impacting tank closure decisions to invoke a cost/benefit argument at this time, it is informative to conduct a preliminary evaluation of the risk reduction benefits of waste retrieval versus cost. The following principal conclusions may be drawn from this study:

- Significant risk reduction has already occurred from retrieval of 241-C-106 waste by past-practice sluicing

- Additional risk reduction by (a) pumping liquids only, (b) removing liquids and sludge to the HFFACO milestone, and (c) removing liquids and sludge to beyond the HFFACO milestone will cost significantly more, per unit of risk reduction, than the risk reduction that has already occurred.

- The cost per unit of risk reduction for progressively cleaner end states in 241-C-106 increases with increasing cost, i.e., in economic terms there is a diminishing marginal rate of return (measured by risk reduction) for increased retrieval costs.

It is important to note that this work effort and method for comparing the net benefit of a given waste retrieval action will continue to evolve as we gain maturity in the tools used to support tank closure decisions.

RETRIEVAL ALTERNATIVES

Previous analyses have been conducted evaluating retrieval technologies for removal of sludge waste from SSTs. This AGA uses the results of those studies to determine the appropriate technologies for retrieval of the sludge from tank 241-C-106 and the 241-C-200 tanks.

The selected alternative for retrieval of the remaining waste in 241-C-106 includes the following key elements:

- Remove the necessary in-tank equipment to support the installation of retrieval system(s).

- Proceed with the pumping of liquid waste volumes from the tank. This effort is intended to remove the majority of the liquid residues and acknowledges the fact that the majority of the key risk drivers (i.e., mobile radionuclide inventory) exist within the liquid waste component. Evaluate use of the existing pipe-in-pipe waste transfer system provided under project W-320 vs. interfacing with the overground transfer line used for 241-C-103 interim stabilization.

- Using the existing infrastructure and the pumping systems deployed, design and place a modified sluicing system within the tank with the goal of retrieving the majority of the residual solid wastes within the tank.

- Evaluate the success of the modified sluicing system. If this retrieval system does not meet the HFFACO goal (less than 360 cubic feet of residuals), then proceed with additional retrieval or, if approved by Ecology, appropriate closure activities pursuant to HFFACO Appendix H.

- Maintain a parallel development and engineering activity for the Mobile Retrieval System as selected in the alternative analysis (Attachment 3). This system would be deployed in order to assure the acceleration of tank closure actions in the event modified sluicing is delayed, or waste retrieval does not achieve the HFFACO retrieval goal and an exception is not obtained.

Deployment of this multi-tiered approach will allow progress, while assuring that the tank closure schedules are not adversely affected by a single technology failure or a regulatory obstacle. CH2M HILL Hanford Group, Inc. has selected this approach as a means to ensure that the success of each retrieval technology identified above can be directly linked to an associated reduction in risk. This approach will provide a means to evaluate the effectiveness of retrieval

technology capabilities for application to future SST retrieval and illustrate a continued commitment to progress for the accelerated cleanup of the Hanford site.

A modified sluicing system has the potential to achieve compliance with the HFFACO retrieval requirements contained in milestone M-45-00. It is recommended for first line deployment since it fits within an allowable cost profile, can be implemented within the tight scheduling demands for the ATCD Project, will assist in the removal of the balance of the liquid and solid wastes, and will achieve removal of key mobile contaminants (including the expected removal of soluble components from the remaining sludge).

It should be noted that the alternative analysis (Attachment 3) was primarily focused on a technical evaluation of retrieval systems. Subsequent strategic planning sessions with ORP modified this recommended approach in an effort to meet the needs for rapid progress in the field, accelerated removal of liquids and sludges and the expectation that the concentration of key contaminants and the volume of the existing waste piles (solids) within the tank would be dramatically reduced in the first two steps of a multi-tiered approach. If additional retrieval is required to comply with the HFFACO, the MRS will be deployed. This provides an opportunity to demonstrate the MRS efficacy in a less demanding environment prior to deployment in future tank retrievals.

This multi-tiered demonstration is proposed in an effort to meet the 360 cubic feet HFFACO retrieval goal. Pending the results of this planned demonstration, and subsequent regulatory approval, it is understood that Ecology may require the deployment of the MRS to complete the removal of additional waste residues. However, the efficiencies g4ined from early deployment of modified technologies, any Authorization Basis modifications, updated environmental permits, tank preparation activities and deployment of trained operational staff would be made available to accelerate the momentum of the retrieval and closure activities for 241-C-106. It is important to note that, per the approach described above, a multi-tiered path for technology development efforts will be pursued to maintain operational flexibility for waste retrieval operations.

CLOSURE ALTERNATIVES

The focus of ATCD Project is to prepare the tank for closure. Closure period for ancillary equipment, surrounding soil and final surface cap design are not evaluated in the AGA.

The DAR (Callison 2002) identified several tank fill alternatives from previous engineering studies and DOE complex experience. Those alternatives were considered in this AGA. Also included in the DAR is a discussion on the use of chemical getters. The development of getters is progressing, and the selection of the particular type to be used will be driven by constituents of concern. It is assumed that some type of getter additive will be used as a component of tank fill for residual waste stabilization. The specific selection and method of application will be determined based on studies planned in fiscal year (FY) 2003. In the mid 1990's, two principal studies were conducted that evaluated structural tank fill alternatives for closure (Skelley, 1996 and SNL, 1998 a, b). Alternatives evaluated assumed complete filling of the tank. The alternatives proposed in Skelley 1996 were essentially homogeneous systems consisting of a

single material type. The tank fill design proposed in SNL 1998a and 1998b assigned different functions to layered components of differing material types.

Fill alternatives being evaluated for the ATCD Project adopt a multi-function approach, assigning different functions to an initial waste stabilization layer, and to the remaining tank void space to be filled (i.e., structural fill zone). An objective for the waste stabilization layer, but not for structural fill, is retrievability pending final decisions on tank farm closure and the amount of waste that must be removed from tanks to support closure. Waste stabilization can include both physical and chemical stabilization with the objective of reducing the mobility of the residual contaminants in the presence of infiltrating water.

Grout fill and granular fill alternatives were evaluated for the waste stabilization layer. Grout was identified as the preferred alternative for both tank 241-C-106 and the 200-series tanks. However, it was noted that events may necessitate revisiting this decision. For example, the issue of reversibility may take on increased importance pending results of the NEPA process, and the current lawsuit challenging DOE's authority to reclassify high-level waste under DOE Order 435.1. Also, planned development of getter materials in FY 2003 may reveal significant differences in performance in a granular fill versus a grout fill. Finally, the choice of retrieval technology could shift the balance in favor of granular fill with getters, if the retrieval equipment allowed mixing of fill material with waste.

Grout, gravel, concrete, hybrid (gravel, followed by grout injection), and a multi-layer fill were evaluated for the tank structural fill. For this application, grout installed in lifts was selected as the preferred tank fill alternative.

RISK ASSESSMENT STRATEGY

Numerous procedural and regulatory requirements drive the need to assess long-term and short-term risks for waste retrieval and tank closure. The risk assessment strategy for the ATCD Project builds on a significant body of past work including the *C Tank Farm Retrieval Performance Evaluation* (RPE) (DOE-RL 1999), *A/AX and C Tank Farm Subsurface Characterization Report* (Draft), *Phase I RCRA Facility Investigation/Corrective Measures Study Work Plan for SST Waste Management Areas* (DOE-RL 2000), and the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) *200 Area RJ/FS Master Plan.* Risk assessment for the ATCD Project will be strongly integrated with the data gathering efforts of the Vadose Zone Characterization program, Immobilized Low Activity Waste program, RCRA Groundwater Monitoring Well Drilling program, improvements in the SST Farm Best Basis Inventory (BBI 2001), and the 200 Area CERCLA Remediation program.

The recommended long-term risk assessment approach includes the following elements:

- Define performance objectives
- Define the conceptual exposure model
- Define the site physical conceptual model

- Identify and catalog the input values for fate and transport simulations
- Identify relevant closure management alternatives and decisions
- Implement the risk assessment simulations

The recommended short-term risk assessment approach involves developing worker exposure scenarios for tank closure, assessing risk for those scenarios, and either mitigating risk through engineering design or operational controls, or avoiding risk by requesting exemption from regulatory criteria (e.g., HFFACO Appendix H).

The recommended ecological assessment approach is to become integrated with the Central Plateau Ecological Assessment currently underway between Ecology and DOE.

REFERENCES

BBI, 2001, *Best Basis Inventory,* access page located at: http://twins.pnl.gov:8001/twins.htm, as of May 2001.

Callison, S. W., 2002, "Accelerated Tank Closure Demonstration Data Assessment," RPP-10950, Revision 0, August 2002, CH2M HILL Hanford Group, Inc., Richland, Washington.

DOE-RL, 1999, *Retrieval Performance Evaluation Methodology for the AX Tank Farm,* DOE/RL-98-72, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2000, *Phase 1 RCRA Facility Investigation/Corrective Measure Study Work Plan for Single-Shell Tank Waste Management Areas,* DOE/RL-99-36, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

"Hazardous Waste Management Act," RCW 70.105, *Revised Code of Washington*, as amended.

Lee, T. A., 2002, "Approach for the Accelerated Tank Closure Demonstration Project," RPP-11085, Revision 0. July 2002, CH2M HILL Hanford Group, Inc., Richland, Washington.

National Environmental Policy Act of 1969, 42, USC 4321, et seq.

Skelly, W. A. 1996, *Engineering Study of Tank Fill Alternatives for Closure of Single-Shell Tanks*, WHC-SD-WM-ES-399, Westinghouse Hanford, Company, Richland, Washington.

SNL, 1998a, *Stabilization of In-Tank Residual Wastes and External-Tank Soil Contamination for the Hanford Tank Closure Program: Applications to the AX Tank Farm,* SAND98-1460, Sandia National Laboratories, Albuquerque, New Mexico.

SNL, 1998b, *Stabilization of In-Tank Residual Wastes and External-Tank Soil Contamination for the Hanford Tank Closure Program: Applications to the AX Tank Farm,* SAND98-2445, Sandia National Laboratories, Albuquerque, New Mexico.

"State Environmental Policy Act of 1983 (SEPA)," RCW 43.21c, *Revised Code of Washington,* as amended.

Resource Conservation and Recovery Act of 1976, 42, USC 6901, et seq.

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FINDING OF NO SIGNIFICANT IMPACT

ACCELERATED TANK CLOSURE
DEMONSTRATION (ATCD) PROJECT

HANFORD SITE, RICHLAND, WASHINGTON

U.S. DEPARTMENT OF ENERGY

JUNE 2003

AGENCY: U.S. Department of Energy

ACTION: Finding of No Significant Impact

SUMMARY: The U.S. Department of Energy (DOE) has prepared an Environmental Assessment, DOE/EA-1462, to assess environmental impacts associated with the Accelerated Tank Closure Demonstration (ATCD) Project. Based on the analysis in the EA, and considering state agency comments, DOE has determined that the proposed action is not a major federal action significantly affecting the quality of the human environment within the meaning of the "National Environmental Policy Act of 1969" (NEPA), 42 U.S.C. 4321, et seq. Therefore, the preparation of an Environmental Impact Statement (EIS) is not required.

ADDRESSES AND FURTHER INFORMATION: Single copies of the EA and further information about the proposed action are available from:

U.S. Department of Energy
Office of River Protection
R. W. Lober, NEPA Document Manager
P.O. Box 450
Richland, Washington 99352
Phone: (509) 373-7949
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For further information regarding the DOE NEPA process, contact:

Ms. Carol M. Borgstrom, Director
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PURPOSE AND NEED: The U.S. Department of Energy needs to collect engineering and technical information on 1) the physical response and behavior of a Phase I grout fill in an actual tank, 2) field deployment of grout production equipment and 3) the conduct of component closure activities of single-shell tank (SST) 241-C-106 (C-106). This information will be used in evaluating future closure actions of the remaining SSTs and tank farms at the Hanford Site. This information may also support preparation of the Environmental Impact Statement for Retrieval, Treatment, and Disposal of Tank Waste and Closure of Single-Shell Tanks at the Hanford Site, Richland, Washington (Tank Closure EIS).

BACKGROUND: In 1997, DOE issued the "Record of Decision (ROD) for the Tank Waste Remediation System (TWRS) Environmental Impact Statement (EIS)," Hanford Site, Richland,

Washington (62 FR 8693), for the management and disposal of radioactive, hazardous, and mixed waste within the TWRS program. In the TWRS ROD, DOE selected the Phased Implementation alternative as the preferred alternative.

The Phased Implementation alternative consists of Phase I, the development and demonstration phase, and Phase II, the full-scale production phase. In Phase I, which DOE has initiated, various demonstrations are to be conducted to fill data gaps and provide information on the effectiveness of retrieval technologies, characteristics of the tank wastes, effectiveness of waste separation, immobilization techniques, treatment technologies, and the processes involved in closing tanks.

The information gained from this demonstration project is essential for future decisions related to tank farm closure.

PROPOSED ACTION: The ATCD project will provide data on the technical and regulatory framework under which the future closure of tanks can be conducted. The ATCD project will demonstrate component closure actions in single-shell tank C-106 following waste retrieval in accordance with the TWRS EIS and the Hanford Federal Facility Agreement and Consent Order criteria. Retrieved waste will be stored in double-shell tanks at the Hanford Site for future treatment and disposal. Any waste remaining in the tanks will be stabilized. It is estimated that between 30- and 90-cm (12-to 36-in.) of high strength grout (~126- to 380- m^3 or ~160- to ~500- yd^3) would be placed in C-106 as part of the Phase I fill demonstration. This volume assumes that the Phase I fill volume required for waste heel stabilization is a minimum of 30.5 cm (12 in.) deep in a flat-bottomed tank. To evaluate the grout behavior around in-tank equipment during placement, additional grout will be placed in C-106. The actual volume of fill may vary depending on the height of the waste heel and the height of equipment present. Prior to the placement of any fill material in C-106, DOE has committed to review the success of the tank waste retrieval efforts with the State of Washington Department of Ecology (Ecology). Placement of the Phase 1 grout would not commence until Ecology and DOE concur that retrieval goals have been satisfied.

Technical and regulatory data obtained will contribute to an understanding of how to place grout in tanks, how to effectively manage the deployment of grout production equipment and identifying the resources that will be necessary for closure as well as the durations involved. During the planning and laboratory testing of grout formulations, information will also be obtained that will contribute to the evaluations in the Tank Closure EIS and to the subsequent decisions DOE will make concerning closure of tank farms and tank farm systems. This information will be developed to support the Tank Closure EIS and Record of Decision and is expected to provide DOE critical information that is based on actual experience with the technical and regulatory issues that will affect tank farm closure.

ALTERNATIVES CONSIDERED:

No Action Alternative: Under the No Action alternative, DOE would not conduct tank closure demonstrations. The existing tank farm operation and management procedures would be maintained. This alternative would be consistent with continuing to implement the Phased Implementation alternative as selected in the TWRS Record of Decision (62 FR 8693), but no new information would be gained.

Alternatives: Alternatives to the proposed action include using a different tank or increasing the number of tanks that would be used in the demonstration and/or using alternative fill materials. Impacts associated with performing the demonstration in a different tank would be expected to be similar to those described for C-106. Increasing the number of tanks would create a proportional increase in the impacts described for C-106. To meet demonstration project requirements, alternative fill materials would have to be able to meet the characteristic test requirements of a flowable high-strength grout.

ENVIRONMENTAL IMPACTS:

Soils: No on-site borrow material would be utilized for the ATCD project, therefore no significant impact to geologic or soil resources is expected.

Surface Water: There would be no impacts to surface waters from the ATCD project.

Floodplains and Wetlands: There would be no impacts to wetlands or designated floodplains from the ATCD project. There are no wetlands or designated floodplains in the project area.

Groundwater: No significant adverse impacts to groundwater are expected as a result of the ATCD project. The stabilization of C-106 residual wastes would benefit the local groundwater resource by reducing the potential for future groundwater contamination.

Air Quality: The ATCD project would be conducted in compliance with state and federal air quality permit requirements. A high-efficiency air filtration system would be used during interim fill placement in tank C-106 to minimize the potential for toxic or radioactive air emissions. Fugitive dust generated by construction traffic would be controlled by dust suppression measures (e.g., water spray or surfactants). Therefore, no substantial adverse impacts to air quality are anticipated.

Biological Habitat: The land in the ATCD project area and the proposed staging area is heavily disturbed. The tank farms underwent extensive excavation when the tanks were installed underground. The staging area is located in a previously disturbed area where overhead and underground utility lines were constructed. The activities of the ATCD project would be conducted in these previously disturbed areas, so there would be no significant impact to biological resources or their habitat as a result of the ATCD project.

Threatened/Endangered Species: No impacts to endangered or threatened species, nesting sites, or habitats are expected because none have been identified in the ATCD project area.

Land Use: The Central Plateau (200 East and West Areas) is designated as an "industrial-exclusive" area capable of supporting waste treatment, storage, and/or disposal activities for hazardous, dangerous, radioactive, nonradioactive wastes and related activities. There would be no change in land use as a result of the ATCD project.

Prime and Important Farmlands: Since no lands designated as prime farmlands are in the ATCD project area, there would be no impacts to such lands.

Socioeconomics: The ATCD project would be conducted within the boundaries of the 200 East Area of the Hanford Site and specifically in areas in and adjacent to the C farm. The workforce for the ATCD project would average about 20 workers from the current Hanford workforce. Therefore no significant socioeconomic impacts would be expected

Environmental Justice: Based on the analysis in this EA, no high or disproportionate adverse health or economic impacts to minority or low-income populations, therefore, no environmental justice impacts would be expected.

Utilities: The ATCD project would utilize existing utility services in the C tank farm. This project would not require construction or development of new permanent utility lines.

Health and Safety: Occupational accident risks and routine radiological exposures related to the ATCD project are not expected to be substantial.

Cultural Resources: No impacts to known cultural resources within the ATCD project site or C tank farm would be expected. If cultural resources were encountered during the demonstration, work would be halted and the Hanford Historical and Cultural Resources Program would be notified to determine the appropriate disposition of the resource and any mitigative actions that would be required prior to continuing with the project.

Visual/Noise: No significant impacts to views or view sheds would be expected due to the ATCD project. Noise levels from the ATCD project would be short-term, limited to the duration of the demonstration activities.

Transportation: Traffic generated by the ATCD project would be within the existing traffic volumes and would not contribute to the cumulative impacts to the transportation system of the site or the surrounding communities.

Cumulative Impacts: Because no significant adverse impacts would be expected from the proposed action, there would be no substantial contribution to Hanford Site cumulative impacts.

DETERMINATION: Based on the analysis in the EA, and after considering the comments received from the Oregon Office of Energy, and the State of Washington Departments of Ecology, and Fish and Wildlife, I conclude that the proposed ATCD Project does not constitute a major federal action significantly affecting the quality of the human environment within the meaning of NEPA. Therefore, an EIS is not required.

Issued at Richland, Washington, this 16th day of June, 2003.

Roy J. Schepens, Manager
Office of River Protection