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Revision 3

Waste Management Area C Closure Demonstration Project Plan

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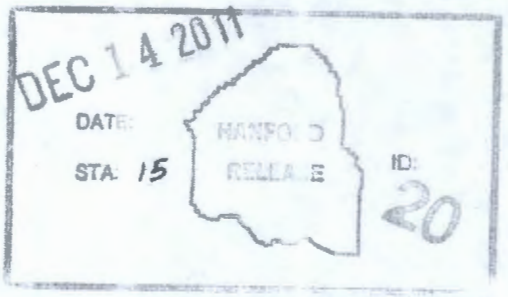
Abstract: This document presents the results of a collaborative effort between the Washington State Department of Ecology, U.S. Department of Energy, Office of River Protection, and its tank operating contractor to obtain information needed for closure of Waste Management Area C. The Project Plan Catch Tank, a 100-series tank removal evaluation, contaminated soils, waste determination demonstration, closure white paper, and a RCRA/CERCLA integration white paper



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Abbreviations and Acronyms

C-200 Project Plan	2006 C 200 Demonstration Project Plan
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FY	fiscal year
HFFACO	*Hanford Federal Facility Agreement and Consent Order*
NEPA	*National Environmental Policy Act of 1969*
ORP	Office of River Protection
RCRA	*Resource Conservation and Recovery Act of 1976*
RD&D	Research, Development and Demonstration
RFI/CMS	RCRA Facility Investigation and Corrective Measures Study
SST	single-shell tank
TC&WM EIS	Tank Closure and Waste Management Environmental Impact Statement
TOC	tank farm operating contractor
UPR	unplanned release
WAC	Washington Administrative Code
WIR	Waste Incidental to Reprocessing
WMA	waste management area

1.0 PURPOSE AND ROLE OF THIS PROJECT PLAN

1.1 REVISION OF THE C-200 DEMONSTRATION PROJECT PLAN

This plan revises the C-200 Demonstration Project Plan that was developed by members of the Washington State Department of Ecology (Ecology), the U.S. Environmental Protection Agency (EPA), the U.S. Department of Energy (DOE) Office of River Protection (ORP), and the tank farm operating contractor (TOC) responsible for development of demonstration projects pertinent to closure of waste management area (WMA) C (hereinafter the "Project Team"). This Plan was originally prepared in 2006 and formally transmitted by Ecology to ORP and its contractor on June 6, 2007 (Letter 0701487), "Re: Transmittal of Final "C-200 Demonstration Project Plan"""). New[1] *Hanford Federal Facility Agreement and Consent Order* (HFFACO) (Ecology et al. 1989) milestones M-045-80 and -81 require completion of tasks identified in the 2006 C-200 Demonstration Project Plan (C-200 Project Plan) and any subsequent revisions to this plan. Two other new milestones require that a complete permit modification request for WMA C closure actions be submitted by September 30, 2015 (M-045-082) and that closure of WMA C be completed by June 30, 2019 (M-045-83).

The Project Team recognized that the 2006 C-200 Project Plan needed to be revised to align with the goals and tasks required for WMA C closure by 2019. This revised WMA C Demonstration Project Plan (WMA C Project Plan) identifies the current scope of the demonstration activities as agreed to by Ecology and ORP that will be required to meet the HFFACO milestones.

At the time of development of the C-200 Project Plan, the 241-C-200 tank system single-shell tanks (SSTs) and certain associated equipment were selected as the area for emphasis within WMA C for the Project because it includes most of the elements present in a typical tank farm such as tanks, encased and direct buried pipes, diversion boxes, pump pits, and unplanned release (UPR) sites (not all WMA C ancillary equipment, such as the 244-CR-Vault, were chosen as a focus area for the demonstration planning). However, because the scope of the demonstrations now include the entire WMA C area, as agreed to by Ecology, this Project Plan was renamed the "WMA C Closure Demonstration Project Plan" to reflect this change.

Table 1-1 summarizes the primary focus area scope changes from the C-200 Project Plan that have been agreed to by the Project Team in this plan. Milestones associated with plan deliverables are shown in Table 1-2.

It is anticipated that the WMA C Project Plan will continue to undergo revision as tasks are completed and new information is obtained. Many of the tasks presented in this plan are phased activities in which information must be gathered before it is understood whether demonstrations

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[1] Between 2007 and 2009, as a result of a lawsuit filed by the State of Washington, DOE and the Washington Department of Ecology negotiated some new and revised HFFACO milestones, along with new milestones in a Consent Decree to be filed in federal district court. Both the Consent Decree and HFFACO changes became effective on October 25, 2010, the date the Consent Decree was entered into federal court. *See* various HFFACO change packages and *State of Washington v. DOE*, Consent Decree, Case No. 08-5085-FVS (October 25, 2010), Eastern District of Washington (hereinafter the "Consent Decree".)

or other data needs will be required to make closure decisions. When this occurs, a revision to this Project Plan will be made as agreed to by the Project Team.

Table 1-1. Scope Changes to Primary Focus Area

C-200 Project Plan Primary Focus Areas	Completed	Retained with Original Scope	Scope Updated in WMA C Project Plan	Milestone
Pipelines and Diversion Boxes			✓	M-045-081
C-301 catch tank		✓		M-045-080
Tank removal evaluation			✓	M-045-080
UPR and contaminated soils[1]		✓		M-045-61[1]
Waste determination demonstration			✓	M-045-080
Closure white paper	✓			NA
RCRA/CERCLA white paper		✓		M-045-080

[1] Contaminated soil is being addressed separately under the *Hanford Federal Facility Agreement and Consent Order*, e.g., Milestone M-045-61.

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
RCRA = *Resource Conservation and Recovery Act of 1976*
UPR = unplanned release
WMA = waste management area

Table 1-2. Waste Management Area C Closure Project Plan Milestones in the *Hanford Federal Facility Agreement and Consent Order*

M-045-80	Complete those portions of the C-200 Closure Demonstration Plan necessary to complete closure plan development for the SST system. Those portions of the Demonstration plan include: (1) description of the radioactive waste determination process that DOE will utilize for the component of Tank Waste residuals subject to DOE authority, (2) a RCRA/CERCLA Integration White Paper, (3) a tank removal engineering study, and (4) an evaluation of alternatives for removal of waste from the C-301 catch tank.	1/31/2011
M-045-81	Implement and complete all remaining activities in the June 6, 2007 C-200 Closure Demonstration Plan (with any revisions as agreed to by Ecology and DOE). Provide a report that documents the results of those activities and provides interpretations and recommendations consistent with the Project Goals, Objectives, and Products described in Section 5 of the Plan.	9/30/2014

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
DOE = U.S. Department of Energy
Ecology = State of Washington Department of Ecology
RCRA = *Resource Conservation and Recovery Act of 1976*
SST = single-shell tank

1.2 PURPOSE OF THE WASTE MANAGEMENT AREA C DEMONSTRATION PROJECT

The purpose of the Demonstration Project is to gather engineering, cost and other information on various technologies that might be used to (1) close SST WMAs; (2)identify and begin to gather information needed for specific regulatory decisions associated with closure of the SST WMAs [including determining if clean closure is practicable for the SSTs as described in Washington Administrative Code (WAC) 173-303-640, "Tank Systems," Subsection (8)(b)], and; (3) develop a common understanding of the regulatory processes to facilitate the permitting process. Through development and implementation of the Demonstration Project focus areas, the Project Team will maintain the collaborative working relationship that is critical to achieving closure of WMA C by 2019 (in accordance with HFFACO milestone M-045-83).

Information and data generated during the Demonstration Project will help the public and decision makers to better understand the closure process. The data collected will support closure planning and contribute to the decision-making process for WMA C and other WMAs. As a collateral benefit, this information and data also will be relevant to environmental investigations, feasibility studies, and cleanup at other areas contaminated with tank waste in and around tank farm environments.

The Demonstration Project will not gather all the information needed for closure, nor is it intended as a substitute for the formal closure process, including closure planning and related modifications to the Hanford Facility Dangerous Waste Permit (WA7 89000 8967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion for the Treatment, Storage, and Disposal of Dangerous Waste*). The formal closure process, including closure planning, will be carried out according to the requirements of the Washington State Dangerous Waste Regulations and the HFFACO.

1.3 ROLE OF THE PROJECT PLAN

The WMA C Project Plan is a statement of the intentions of the Project Team. It reflects requirements that the Project Team agree are appropriate for the Project and is also intended to support budget planning and communication with the public and other stakeholders. Although information gathered during the Project may be used in development of future permit conditions, the Project Plan does not constitute a permitting action.

The Project Plan does not alter or change the processes agreed to by Ecology, EPA, and ORP in Section 9.2 of the HFFACO or change any permit condition, does not constitute a decision under the *National Environmental Policy Act of 1969* (NEPA), and does not prejudice the completion of the DOE/EIS-0391, *Draft Tank Closure and Waste Management Environmental Impact Statement* (TC&WM EIS) decision-making process. Those portions of this Project that are associated with characterization requiring review under NEPA are covered under the Tank Waste Remediation System Environmental Impact Statement (EIS) Record of Decision. The Project Plan is not, in and of itself, an enforceable document, although the Project addresses work required to meet HFFACO milestone requirements.

2.0 ROLES OF THE PARTIES

The WMA C Demonstration Project was a joint effort among Ecology, EPA, ORP and the TOC. Each agency/organization had an important role to play in the development of the Project and in the closure process. The ORP is responsible for closure of WMA C in accordance with applicable regulations and HFFACO requirements and close coordination with other closure and cleanup activities for the Central Plateau. Ecology is the lead regulatory agency responsible for oversight and permitting for closure of WMA C, and EPA is the non-lead regulatory agency supporting this project. The EPA did not take an active role in revision of this plan.

The EPA was a participant in the Project because of the Agency's role under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA). The 200 Area, which includes WMA C, is on the National Priorities List. The EPA will select the final remedy for the 200 Area under CERCLA if DOE and EPA cannot agree on a final remedy selection.[2] The overall completion of remediation in the 200 Areas eventually will be finalized through both CERCLA decisions made by EPA and *Resource Conservation and Recovery Act of 1976* (RCRA) permitting decisions made by Ecology. Although EPA is not the decision maker for RCRA permitting or for closure, EPA's input during the Project is important to help ensure that RCRA closure actions are not inconsistent with future CERCLA remedial decisions on the Central Plateau. The EPA has submitted a letter offering ongoing support for the C-200 Project. This letter is included as Attachment 1.

The EPA will be apprised of the progress and changes to this plan as part of the quarterly TPA project managers meeting. This meeting will be the mechanism for ensuring EPA involvement in WMA C closure.

[2] *See* 42 U.S.C. § 9620(e)(4)(A).

3.0 WASTE MANAGEMENT AREA C BACKGROUND

Under RCRA and Washington State's authorized regulations for hazardous/dangerous waste management, WAC 173-303, "Dangerous Waste Regulations," dangerous waste treatment, storage, and disposal units must go through a process called closure. During the closure process, units (including ancillary equipment) are taken out of service and the unit and any areas affected by releases from the unit are properly cleaned up or decontaminated.

The closure process and applicable regulatory requirements are described in detail in the "Single-Shell Tank Waste Management Area C Closure White Paper" (Attachment 2). Completing closure for dangerous waste treatment, storage, and disposal units is an important part of the overall Hanford cleanup. Single-shell tanks are subject to closure according to the permit schedule of compliance and based on the HFFACO Milestone M-45-00.

The WMA C (or 241-C Tank Farm) was constructed from December 1943 to February 1945. It was connected to B Plant in 1945 and to the Hot Semiworks Plutonium Uranium Extraction process in 1954. The WMA C contains twelve 100-series tanks and four 200-series tanks. The 100-series tanks are 23 m (75 ft) in diameter, have a 5-m (15 ft) operating depth, and have an operating capacity of 1,892,700 L (530,000 gal) each. The 200-series tanks are 6 m (20 ft) in diameter with a 7.32-m (24 ft) operating depth and an operating capacity of 208,000 L (55,000 gal) each. The tanks sit below grade with at least 2 m (7 ft) of soil cover to provide shielding from radiation exposure to operating personnel. Tank pits are located on top of the tanks and provide access to the tank, pumps, and monitoring equipment.

4.0 PROJECT APPROACH AND SCOPE

The Project Team used a collaborative approach to develop the scope of the WMA C Demonstration Project. The Project Team began meeting regularly in November 2005 to identify Project priorities and make decisions about Project scope and direction. Meetings were facilitated and documented by a neutral third party. Small groups chartered by the Project Team and focused around particular Project elements met more often for more detailed scoping and development of specific aspects of the Project.

To date, the Project Team has identified seven primary focus areas for the Project:

1. Pipelines and diversion boxes (Section 6.0)
2. The C-301 catch tank (Section 7.0)
3. Tank removal evaluation and grout demonstration (Section 8.0)
4. UPRs and contaminated soils (Section 9.0)
5. Radioactive waste determination for SST residual waste that will be disposed of onsite (Section 10.0)
6. Closure white paper (Section 11.0)
7. RCRA/CERCLA white paper (Section 12.0).

The Project Team recognizes that, over time, perspectives about these information needs may change. Additional information needs may be developed, or some or all of these information needs may be dropped because information is determined not to be necessary or is gathered in another way or through another process, or priorities change. The Project Team will incorporate changes in information needs for the WMA C Demonstration Project into the ongoing WMA C Demonstration Project documentation and updates to this Project Plan. The Project is structured to be iterative and to follow a logical sequence of activities. As each activity is complete, the information and knowledge gained will be evaluated to ensure that defined information needs are being met and remaining activities are scoped properly. As appropriate, changes will be made based upon experience and lessons learned, and adjustments in the work scope will be made to ensure that information needs are satisfied.

5.0 PROJECT GOAL, OBJECTIVES AND PRODUCTS

The overall goal of the WMA C Demonstration Project is to support the decision process associated with closure of WMA C in a way that meets regulatory requirements.

The overall objective of the WMA C Demonstration Project is to identify what is needed to be known about actions that may be taken in the future to dispose of waste and close SST WMAs and to identify how the needed data will be obtained in a timely way. Many types of information will be gathered as part of the Project. Other information will be gathered through review of records and other existing data, or as part of activities, such as characterization work, that do not require new permitting. Still other information will be gathered as part of other efforts at the Hanford Site, such as the ongoing RCRA Facility Investigation and Corrective Measures Study (RFI/CMS).

The Project has six specific objectives.

1. Identify data needs to adequately characterize and make closure decisions for underground tanks, ancillary equipment, and contaminated soil.

2. Identify and field test technologies and techniques that might be used to characterize or clean up underground tanks, ancillary equipment, and contaminated soil and determine which are feasible for closure of tank systems.

3. Understand the RCRA closure requirements and how these requirements interface with RCRA corrective action and CERCLA standards.

4. Coordinate with the ongoing RCRA investigation work for contaminated soil to determine whether there are additional soil characterization needs for WMA C closure, or whether to complete some soil characterization activities more quickly in light of closure needs.

5. Describe a radioactive waste determination process for SST mixed waste residuals that follows applicable DOE regulatory criteria for on-site burial and includes review by Ecology under applicable authorities.

6. Effectively communicate with Tribal governments, stakeholders and the public on closure issues.

It is anticipated that the Project will result in the following.

1. A report on the technologies and methods applicable to the evaluation of residuals present in the pipelines and closure alternatives for pipelines. This document will be informed by review and consideration of the history/status of ancillary equipment in the SST system (see Section 6.0). This report would not contain the long-term risk assessment associated with pipelines. Long-term risk to human health and the environment will be developed in the WMA C performance assessment. As warranted by the feasibility evaluation, follow-on work may be recommended.

2. A feasibility evaluation for determination of characterization and closure alternatives for diversion boxes (Section 6.0).

3. An evaluation for removal of waste from the C-301 catch tank (see Section 7.0).

4. An evaluation of removal of a 100-series tank in WMA C (see Section 8.1) and demonstration activities associated with grout testing (Section 8.2). Ecology and ORP agree this meets the intent of action item three (3) as set forth in HFFACO milestone M-045-80.

5. A description of the radioactive waste determination process that DOE will utilize for the component of tank waste residuals subject to DOE authority (see Section 10.0).

6. A white paper on the closure process to address, among other things, how to determine whether clean closure is practicable (see Section 11.0 and Attachment 2).

7. A white paper on RCRA/CERCLA issues to address identification and resolution of key issues related to ensuring that closure work is not inconsistent with future remedial decisions under CERCLA (see Section 12.0).

In addition, this Project is expected to fill data gaps necessary to obtain resource, schedule, planning, cost, and worker safety data on all field activities for purposes of developing closure plans and corrective measure studies.

6.0 PIPELINES AND DIVERSION BOXES

6.1 PIPELINES

The WMA C includes approximately 6 miles of direct buried and encased pipelines. To define the information requirements needed to assess characterization and closure requirements, a pipeline feasibility evaluation will be developed. This report will provide information that will be used to make decisions regarding the need for and scope of future demonstrations or data gathering efforts. The draft feasibility evaluation was finalized in fiscal year (FY) 2010.

The feasibility evaluation will include a detailed summary of the history and physical attributes of all WMA C pipelines including an assessment of their likely inventory and the uncertainty around the inventory information. Information needs for pipelines are closely related to information needs for diversion boxes and pump pits. Historical records on piping will be reviewed as part of the feasibility evaluation to determine the current state of piping. During scoping of the Project an evaluation of historical records on piping was initiated but was limited to only those pipelines associated with the 241-C-200 tank system. Additional review of historical records is needed that looks at all of the pipelines in WMA C which may identify specific pipelines that would be good candidates for possibly conducting field demonstrations. Information on construction, operation, and termination of pipeline usage in WMA C will be summarized and will include:

1. When construction occurred, the final constructed configuration and the timeframe of the construction

2. Procedures that directed how waste transfers to WMA C were to be conducted, including pre- and post-transfer procedures (running hot water to warm up the lines and flushing post transfer) and monitoring these operations

3. Explanation of the termination of the use of WMA C and the current status and condition of the pipelines (possible plugs or leaks, etc.).

Additional information will be compiled to describe the likely current state of piping, including:

1. Pipeline type (i.e., waste transfer gravity flow, metal recovery pressurized, etc.)

2. Pipeline size and material (stainless steel, vitrified clay, carbon steel, etc.)

3. Physical configuration (direct buried, encased, active line, spare or blank, average depth below ground surface, depth at each end point, slope, over burden material, connection configuration [jumper connections, jet pump connections], distance/relationship to other tank farm elements [tanks, other pipelines, diversion box, vault, etc.]), operation history, maintenance history (replacement, abandonment, etc.), and locations where inconsistent pipeline materials are joined

4. Reference to RPP-25113, *Residual Waste Inventories in the Plugged and Abandoned Pipelines at the Hanford Site*, on plugged pipelines

5. Reference to RPP-RPT-29191, *Supplemental Information Hanford Tank Waste Leaks*, and current knowledge of known or suspected releases from pipelines

6. Identification of known or anticipated "clean" pipelines

7. Identification of known or anticipated contaminated pipelines

8. Identification of known or suspected failed or plugged pipelines

9. Identification of flushed pipelines.

Contributions to risk to human health and the environment based on pipeline attributes, inventories, and uncertainties will be described in the feasibility evaluation which will help with decisions regarding the extent of future pipeline characterization and remediation actions. The feasibility evaluation will include a summary of past risk assessments as they relate to pipelines that were performed as part of DOE/ORP-2005-01, *Initial Single-Shell Tank System Performance Assessment for the Hanford Site*. In addition, a new set of scoping calculations will be performed using the ECOLEGO toolbox[3] that will evaluate potential impacts over a range of possible uncertainties in waste volumes and inventories within the pipelines.

The pipeline feasibility evaluation will include a detailed discussion on available methods to characterize or verify inventory in a range of buried pipelines as well as estimating the quality of the characterization data that would result, including sources of uncertainty. As part of this effort, ORP previously received support from the DOE Headquarters Office of Environmental Management which convened an expert panel on pipeline characterization technologies in October 2006. The panel considered non-destructive and destructive inspection and characterization techniques for pipelines. These technologies will be further screened to identify which, if any, would be appropriate technologies to be included in a demonstration in the event further characterization of the pipelines is warranted.

The feasibility evaluation will also include discussion of available methods to remove or remediate sections of buried pipelines including stabilization and removal technologies. Where available, information on long-term risk, worker dose, cost, and implementability associated with performing characterization and remediation activities will be discussed.

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3 Ecolego is a MATLAB® (a trademark of The MathWorks, Inc., 3 Apple Hill Drive, Natick, Massachusetts) toolbox for modeling dynamic systems and performing risk assessments using model simulations. The ECOLEGO toolbox is a set of compartmentalized software tools developed by Robert Broed and Shulan Xu of Facilia Consulting (Sweden) that has been successfully applied in the field of radionuclide/contaminant fate and transport modeling and risk assessment at a variety of high-level waste repositories and low-level waste sites in Europe and South Africa.

6.2 DIVERSION BOXES

In addition to a pipeline feasibility evaluation, a diversion box feasibility evaluation will be performed to gather historical information on physical attributes and identify data needs for closure. This study will interface with the pipeline feasibility evaluation. The study will look at the seven diversion boxes present within WMA C and include the most recent drawings for these structures. Information on the status of nozzles within the boxes, where available, will include:

- nozzle locations
- whether nozzles are open or capped
- associated pipeline number for each nozzle
- pipeline end locations.

Characterization needs based on this information will be recommended and a data quality objectives process may be subsequently performed as needed. Cost estimates for accessing diversion boxes to determine current condition and content, including removal of cover blocks or core drilling through cover blocks, will be included.

Changes to scope or schedules that result from the information presented in both the Pipeline and Diversion Box Feasibility Studies are expected to be documented in revisions to this WMA C Project Plan.

7.0 C-301 CATCH TANK

The C-301 Catch Tank is a 36,000-gal reinforced concrete tank located near the north, northwest boundary of WMA C. It is connected to Diversion Box C-252 by a drain line and was intended to receive any releases from the Diversion Box (it also is connected to Diversion Boxes C-151, C-152, and C-153 by similar drain lines). To the extent practical, liquids were removed from the Catch Tank in 1985. Current estimates are that the tank contains approximately 9,000 gal (4 ft) of sludge and approximately 1,500 gal (7.5 in.) of liquid.

Due to its design, the C-301 Catch Tank presents a unique challenge to refine retrieval planning for other catch tanks within SST WMAs. Retrieval of the waste in the C-301 Catch Tank also represents an opportunity to reduce total inventory in WMA C. Initially, an engineering study will be prepared to evaluate potential removal technologies for the waste in the catch tank and define criteria for selecting a technology for waste removal. The engineering study will be completed in FY 2011. The engineering study will support development of a tank waste retrieval work plan for the C-301 Catch Tank. After selection of a residual waste retrieval technology, design and construction of the catch tank waste removal system, compatibility sampling, removal of catch tank wastes, and evaluation and reporting on the results of the process and lessons learned including cost and worker exposure data will be completed.

A data quality objectives process for characterizing this tank was completed by Ecology, ORP, and its contractor in support of retrieval and closure of this tank. A data quality objectives report and sampling and analysis plan has been completed. The data quality objectives/sampling and analysis plan will support retrieval (compatibility sampling) and closure of the C-301 Catch Tank. Samples are planned to be taken prior to retrieval and the need for post-retrieval sampling for closure purposes will be evaluated based on the compatibility sample and the configuration of waste after retrieval.

8.0 TANK REMOVAL[4] EVALUATION AND GROUT DEMONSTRATION

The C-200 Project Plan included a primary focus area for developing an evaluation of the feasibility of removal of a C-200 Series SST. The purpose of this evaluation was to determine whether placement of grout in the tank would result in an irreversible action that could foreclose removal or decontamination options should these be required for tank closure. In addition, the C-200 grout demonstration would demonstrate grout formulations and delivery systems in the field.

Recent WMA C closure planning has determined that a removal evaluation and grout demonstration of a C-200 tank is not required. Removal evaluations will instead focus on the 100-Series tanks in order to provide information necessary to demonstrate whether or not landfill closure will be pursued at WMA C. Ecology and ORP have agreed this re-focusing meets the intent of action item three (3) as set forth in HFFACO milestone M-045-80.Specific grout testing will not occur in a C-200 tank, instead, cold testing of grout formulations and delivery systems was completed (RPP-RPT-41550, *Closure Demonstration Grout Test Report*). The following information describes the change in scope for this primary focus area of the Demonstration Project.

8.1 TANK REMOVAL EVALUATION

For closure of a tank system, WAC 173-303-640(8)(a) requires that "the owner or operator must remove or decontaminate all waste residues, contaminated containment system components (liners, etc.), contaminated soils, and structures and equipment contaminated with waste, and manage them as dangerous waste" unless ORP demonstrates in accordance with WAC 173-303-640(8)(b) that such removal or decontamination cannot be practicably achieved. Upon successfully demonstrating that removal or decontamination pursuant to WAC 173-303-640(8)(b) cannot be achieved, ORP will be required to "close the tank system and perform postclosure care in accordance with the closure and post-closure care requirements that apply to landfills (see WAC 173-303-665(6))."

As part of the demonstration for determining that removal or decontamination can or cannot be achieved at WMA C, information will be developed that evaluates the ability to remove 100-Series tanks in WMA C after retrieval in compliance with Section IV-B-1 and Appendix B, Project B-1 of the Consent Decree for all tanks within WMA C other than C-103, C-106, C-201, C-202, C-203, and C-204 tanks.[5] Information used to support the development of the TC&WM EIS will be used as a basis for this feasibility evaluation. This evaluation will be a part of an ORP closure plan application that will be submitted to Ecology for making a decision on closure at WMA C. The closure plan application may include other evaluations.

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[4] For the sake of clarity, note that the word "removal" herein is not being used in the technical sense of a "removal action" under CERCLA but is being used consistently with its colloquial definition.

[5] Retrieval has already been completed for tanks C-103, C-201, C-202, C-203, and C-204 in compliance with HFFACO Milestone M-045-00 (i.e., retrieval of as much waste as technically possible, with tank residues not to exceed 360 ft^3 in each of the 100-series tanks, 30 ft^3 in each of the 200-series tanks, or the limit of waste retrieval technology capability, whichever is less). In addition, the allowable residual waste volume in tank C-106 is being evaluated pursuant to HFFACO Action Plan Appendix H

Evaluation of removal of discrete areas of soil or portions of the tank system that are deemed to be required in order to protect human health and the environment will occur as part of the RCRA RFI/CMS and component closure plan applications, respectively, should landfill closure be determined.

8.2 GROUT DEMONSTRATION

Grout placement is an important demonstration activity in order to gain information on grout formulation, delivery, and mixing techniques. Grout demonstration testing was initiated in FY 2009. This testing included demonstration of methods for delivery of grout into both 200-Series and 100-Series tanks as well as evaluation of different grout formulations, and results were summarized in RPP-RPT-41550. This report was submitted for information to Ecology. Further grout testing will be performed in the FY 2014 to 2015 time frame to refine the earlier grout demonstration testing results as needed. Should this testing be necessary to support permit requirements, a report will be developed and submitted to Ecology as part of a request for permit modification.

Grout placement in a C-200 Series tank was a potential focus area under the C-200 Project Plan. In order to place grout into the tank, the Project Team had intended to pursue a RCRA Research, Development and Demonstration (RD&D) permit for grout placement. Because no grout is expected to be added to a tank or component before a final SST System permit is obtained, an RD&D permit is no longer required.

9.0 CONTAMINATED ENVIRONMENTAL MEDIA

9.1 UNPLANNED RELEASE AND CONTAMINATED SOIL

There are 13 known UPR sites inside or adjacent to the WMA C fence line. Most or all of these will be addressed as part of WMA C closure. In general, UPR and contaminated soils are being addressed as part of the ongoing RCRA RFI/CMS work and the ongoing Vadose Zone Project as discussed in RPP-PLAN-39114, *Phase 2 RCRA Facility Investigation/Corrective Measures Study Work Plan Waste Management Area C*. Because of this ongoing effort, no new data needs were identified as part of the WMA C Demonstration Project. The Project will be actively coordinated with the RCRA RFI/CMS work in accordance with RPP-PLAN-39114. As part of this coordination, the Project Team will consider the preliminary results of the RFI/CMS and the Vadose Zone Project to identify whether there are additional soil characterization and/or demonstration needs associated with WMA C or there are benefits to completing some characterization and/or demonstration work on a faster pace than that anticipated for the RFI/CMS or Vadose Zone Project. For example, field work might be desirable as part of the WMA C Demonstration Project to test in situ soil sampling and characterization technologies around one or more WMA C components to demonstrate application of technology in a near-tank environment and evaluate whether the C-200 tanks have leaked. Soil (and any other environmental medium) contaminated as a result of leaks or other releases from the tank system are subject to RCRA closure and other applicable regulatory requirements and will be addressed during the closure process.

9.2 CONTAMINATED GROUNDWATER

Waste Management Area C is one of many sources contributing contaminants to groundwater in the 200-BP-5 groundwater operable unit. The CERCLA and RCRA past practice units also contribute to the 200-BP-5 groundwater operable unit. In recognition of the complexity of remediating groundwater contaminant plumes resulting from multiple source areas, Ecology, EPA, and ORP have agreed that remediation of groundwater in the 200-BP-5 operable unit might occur more expeditiously under CERCLA past-practice authority and related efforts (note that WMA C groundwater monitoring is expected to continue as part of a RCRA groundwater monitoring system to be determined in the future by the RCRA permit). If remediation of groundwater is not sufficiently robust or timely, Ecology has reserved the right to take action under RCRA corrective action authorities to control or contain spreading groundwater contaminant plumes before full-scale remediation of groundwater under a CERCLA Record of Decision begins in the 200-BP-5 groundwater operable unit. For these reasons, contaminated groundwater is not being addressed as part of the WMA C Demonstration Project.

10.0 RADIOACTIVE WASTE DETERMINATION DEMONSTRATION

A Waste Incidental to Reprocessing (WIR) determination is required by DOE O 435.1, *Radioactive Waste Management* in order to classify waste residuals remaining in SST components as low-level waste. All residual wastes in all SST components in WMA C will be included in that WIR determination. Among the WIR Evaluation Process requirements set forth in DOE M 435.1-1 is demonstrating that waste management and disposal (WMA closure) will meet performance objectives comparable to those in 10 CFR Part 61, Subpart C. Two of the Subpart C performance objectives (protection of the general population from releases of radioactivity and protection of inadvertent intruders) require a performance assessment to demonstrate compliance. The performance assessment for WMA C cannot be completed until the TC & WM EIS Record of Decision has been issued, currently anticipated in 2012.

The draft WIR determination, including the performance assessment and other supporting documentation, will be released for public comment and consultation with the Nuclear Regulatory Commission. The draft WIR determination will be provided to Ecology as part of the comment process. Once information from those processes has been duly considered and incorporated as appropriate, a DOE Headquarters official must approve the final WIR waste determination before it becomes effective and the residual wastes are classified as low-level wastes. That final determination must be in place before WMA C closure activities can take place including placing stabilizing media in SST components. T

In accordance with M-045-80, ORP submitted to Ecology a "description of the radioactive waste determination process that DOE will utilize for the component of Tank Waste residuals subject to DOE authority" prior to January 31, 2011.

11.0 CLOSURE WHITE PAPER

The Closure White Paper was completed and is submitted as Attachment 2 of this Project Plan.

12.0 RCRA/CERCLA WHITE PAPER

The RCRA/CERCLA White Paper (RPP-46459) was completed and submitted separately to Ecology by ORP to fulfill Task 2 of Milestone M-045-80 due January 31, 2011.

13.0 PUBLIC INVOLVEMENT

The WMA C Demonstration Project will include a number of opportunities for public involvement. Major opportunities for public involvement include development of a public communication plan for WMA C closure activities that will include:

- public review of the results and reports of demonstration activities
- public review of the draft waste determination(s).

14.0 RELATIONSHIP TO THE TANK CLOSURE AND WASTE MANAGEMENT ENVIRONMENTAL IMPACT STATEMENT

The impacts of various closure alternatives for SSTs are being evaluated in the TC&WM EIS. The three closure scenarios analyzed are landfill closure, landfill closure/clean closure, and clean closure. It is anticipated that once this EIS is published, formal closure decisions will be made. The TC&WM EIS will result in DOE issuing a Record of Decision and Mitigation Action Plan. The Mitigation Action Plan will document the closure process and any mitigation actions DOE intends to implement specific to WMA C, if they are known at the time the Plan is issued. Information developed during the conduct of this WMA C demonstration may be considered by DOE in the development of the EIS Record of Decision but no closure actions or decisions will be made as part of this demonstration. In addition to the information on the impacts of various closure alternatives that is being gathered for the TC&WM EIS, information will be needed on implementation of the physical and regulatory processes associated with closure alternatives. The WMA C Demonstration Project is intended to gather engineering, cost, and other information on the physical processes associated with closure alternatives and develop a common understanding of the regulatory processes before closure planning is complete as well as to facilitate the planning process. The WMA C Demonstration Project will not prejudice or foreclose any of the closure alternatives being evaluated in the TC&WM EIS, and will not result in irreversible resources specific to the demonstration process.

15.0 PROJECT SCHEDULE

The Project schedule in the C-200 Project Plan will be replaced by HFFACO Milestones M-045-080 and M-045-081 in Table 1-2. However, it is expected that some of the tasks will need to be completed before the M-045-081 due date of September 30, 2014 in order to achieve the WMA C closure date milestone of June 30, 2019 (M-045-083).

In addition, the pipeline feasibility evaluation and diversion box feasibility evaluation discussed in Section 6 were completed in 2010. A grout testing report will be completed in the FY 2013 timeframe to support the closure plan submittal process, as needed (see Section 7.0).

16.0 REFERENCES

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WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

WAC 173-303-640, "Tank Systems," *Washington Administrative Code*, as amended.

WAC 173-303-665, "Landfills," *Washington Administrative Code*, as amended.

17.0 SIGNATURES

The WMA C Demonstration Project Plan, a revision to the 2006 C-200 Demonstration Project Plan, is a statement of the intentions of Ecology and the DOE-ORP. It describes the Project scope and schedule that Ecology and the DOE-ORP agree are appropriate,"with any revisions as agreed to by Ecology and DOE", to complete HFFACO milestone M-45-81 by 9/30/2014. The WMA C Demonstration Project Plan is intended to support budget planning and communication with the public and other stakeholders. The Project Plan does not set a precedent for future permitting activities, does not alter or change the processes agreed to by Ecology and DOE in Section 9.2 of the HFFACO or any permit condition, and does not constitute a decision under the NEPA or prejudice the completion of the TC&WM EIS decision-making process. The DOE-ORP and Ecology agree to support and work to gain budget for this scope and schedule.
APPROVED BY:

_____

Jane A. Hedges, Program Manager
Nuclear Waste Program
Washington State Department of Ecology

_____

Thomas W. Fletcher, Acting Assistant Manager for Tank Farms
United States Department of Energy, Office of River Protection

ATTACHMENT 1

LETTER OF SUPPORT FROM U.S. ENVIRONMENTAL PROTECTION AGENCY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 HANFORD/INL PROJECT OFFICE
309 Bradley Boulevard, Suite 115
Richland, Washington 99352

September 8, 2006

Jeff J. Lyon
Tank Waste Storage Project Manager
Washington State Department of Ecology
3100 Port of Benton Blvd.
Richland, Washington 99354

Re: CERCLA Comments on the C-200 Demonstration Project Plan

Dear Mr. Lyon:

During the past year the EPA CERCLA program has provided technical support and input to the C-200 Demonstration Project Plan. The majority of our comments were discussed in project meetings and were incorporated into the plan. After reviewing the latest draft of the plan, we would like to clarify that language in the document – "satisfying CERCLA regulatory requirements" - should be rephrased to reflect the original Appendix I, Section 3.1, third paragraph, language - "to ensure work is not inconsistent with future CERCLA remedial decisions, if any."

We appreciate the opportunity to provide technical support on this project. It's our understanding that RCRA program comments are in the process of being addressed between Ecology and EPA's RCRA program. If you have any questions on the CERCLA program's comments, please contact me at 509-376-6623.

Sincerely,

Tom Post
Remedial Project Manager

cc: Roger Quintero, ORP DOE
Dave Bartus, EPA
Andy Boyd, EPA
Moses Jaraysi, CH2M
Elizabeth McManus, Ross and Associates

ATTACHMENT 2

SINGLE-SHELL TANK WASTE MANAGEMENT AREA C CLOSURE WHITE PAPER

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LIST OF TERMS

Abbreviations and Acronyms

AOC	area of contamination
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
Ecology	State of Washington Department of Ecology
EPA	U.S. Environmental Protection Agency
HFFACO	*Hanford Federal Facility Agreement and Consent Order*
LDR	land disposal restriction treatment standard
MTCA	Model Toxics Control Act
OSWER	U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response
RCRA	*Resource Conservation and Recovery Act of 1976*
SST	single-shell tank
TSD	treatment, storage and disposal
WAC	Washington Administrative Code
WMA	waste management area

WASTE MANAGEMENT AREA C CLOSURE DEMONSTRATION PROJECT GROUP SINGLE-SHELL TANK WASTE MANAGEMENT AREA C CLOSURE WHITE PAPER

1.0 PURPOSE

This paper presents an update to the "C-200 Demonstration Project Group Closure White Paper" originally prepared as Attachment 2 of the C-200 Demonstration Project Plan in 2006 and formally transmitted by the State of Washington Department of Ecology (Ecology) on June 6, 2007. This paper describes regulatory processes for closure of dangerous waste treatment, storage and disposal (TSD) units and the specific framework for closure of such units at Hanford. It is intended to support closure efforts for Single-Shell Tank (SST) System Waste Management Area (WMA) C as part of the WMA C Closure Demonstration Project and therefore is focused on closure requirements for dangerous waste tank systems and environmental media contaminated by the tank system.

For the purposes of this paper, "tank system" refers to the structures including the tanks and their ancillary equipment.

2.0 OVERVIEW OF CLOSURE REQUIREMENTS

"Closure" is the term used in the *Resource Conservation and Recovery Act of 1976* (RCRA) and Washington Administrative Code (WAC) 173-303, "Dangerous Waste Regulations" to refer to the process of taking a hazardous waste TSD unit out of service and properly cleaning up or decontaminating the unit, any associated secondary containment and ancillary equipment, and any areas affected by releases from the unit. When this process is finished, a unit is referred to as "closed." When it is ongoing, a unit is referred to as "closing" or "in closure."

WAC 173-303-040, "Definitions" contains definitions for closure and post-closure as follows:

> "Closure" means:
>
> - The requirements placed upon all recycling, used oil, and TSD facilities, plus some generators, and some transporters to ensure that all such facilities are closed in an acceptable manner (see also "post-closure"); and
>
> - Once taken out of service, the proper cleaning up and/or decontaminating of a dangerous waste management unit or a recycling unit and any areas affected by releases from the unit.
>
> ...

> "Post-closure" means the requirements placed upon disposal facilities (e.g., landfills, impoundments closed as disposal facilities, etc.) after closure to ensure their environmental safety for a number of years after closure.

The SST System is subject to WAC 173-303 requirements for closure of the tank system and for corrective actions for the soil and groundwater that has been contaminated by past tank system operations. Conditions for closure and corrective actions will be contained in the SST System portion of Part V of WA7 89000 8967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion for the Treatment, Storage, and Disposal of Dangerous Waste*, better known as the Hanford Facility Dangerous Waste Permit. Both closure actions and corrective actions must be fulfilled in order to achieve final closure at the SST WMAs.

3.0 GENERAL AND UNIT-SPECIFIC CLOSURE REQUIREMENTS

Dangerous waste TSD units are subject to a general closure performance standard and to unit-specific closure standards. Closures of all units must comply with the general closure performance standards specified in WAC 173-303-610, "Closure and Post-Closure" subsection (2). In addition, closures must achieve standards specific to the type of dangerous waste unit being closed, for example, tank systems must comply with standards at WAC 173-303-640, "Tank Systems," subsection (8).

Although all units must meet the same general closure performance standard, there are two main types of unit-specific closure standards, depending on whether the unit was designed for treatment and storage or for disposal. For units that are designed for treatment and storage (such as container storage units) the goal at closure is to leave no dangerous waste or dangerous waste residuals or contamination that requires further care. In these cases, unit-specific closure requirements specify removal of wastes and waste residuals; decontamination of contaminated liners, structures, equipment (including ancillary equipment) and system components; and removal or decontamination of contaminated soil affected by releases from the unit.

In contrast, for disposal units (such as landfills), by definition, waste and residuals will remain after closure; therefore, the goal at closure is to ensure that these remaining wastes and residues are managed in a manner that protects human health and the environment. In these cases, unit-specific closure requirements specify standards for caps or covers and for long-term monitoring typically referred to as "post-closure care" [WAC 173-303-610(7) and 52 FR 8706, "Hazardous Waste Management System; Land Disposal Restrictions; Final rule"].

Some units, such as surface impoundments, can be used either for treatment and storage or for disposal. In these cases, the unit-specific closure standards provide both a clean closure and a landfill closure (closure with waste left in place) option.

When all waste and waste residues are removed and the unit (structures, ancillary equipment, liners, etc.) and all areas affected by the unit have been removed or decontaminated to specific levels of cleanup, it is referred to as "clean closure." Where the unit or areas affected by releases from the unit are not removed or decontaminated, it is referred to as "closure with waste in

place" or "landfill closure" and post-closure care is required. While the presumption is that units designed for treatment and storage will clean close, in some cases these units have leaked or otherwise contaminated soil so that clean closure is not practicable (see discussions below of unit-specific closure requirements for tank systems and the practicability determination).

4.0 THE GENERAL CLOSURE PERFORMANCE STANDARDS

The general closure performance standard in WAC 173-303-610(2) requires that the owner/operator must close the facility in a manner that:

- Minimizes the need for further maintenance;
- Controls, minimizes or eliminates to the extent necessary to protect human health and the environment, post-closure escape of dangerous waste, dangerous constituents, leachate, contaminated run-off, or dangerous waste decomposition products to the ground, surface water, groundwater, or the atmosphere; and
- Returns the land to the appearance and use of surrounding land areas to the degree possible given the nature of the previous dangerous waste activity.

5.0 UNIT-SPECIFIC CLOSURE REQUIREMENTS FOR TANK SYSTEMS AND CORRECTIVE ACTION REQUIREMENTS FOR CONTAMINATED MEDIA

Unit-specific closure requirements for tank systems are specified in WAC 173-303-640(8). For tank systems that have had releases to environmental media (contaminated soils and groundwater), as is the case with the SST System, corrective actions are required as specified in WAC 173-303-646, "Corrective Action" and the *Hanford Federal Facility Agreement and Consent Order* (HFFACO) (Ecology et al. 1989) Action Plan Appendixes D and I. In addition to meeting the general closure performance standard, owners/operators of tank systems must remove or decontaminate all waste residues, contaminated containment system components (liners, etc.), contaminated soils, and structures and equipment contaminated with dangerous waste. These materials must be managed as dangerous waste unless and until the materials have been delisted and/or no longer exhibit a characteristic or criteria of dangerous waste as specified in WAC 173-303-070, "Designation of Dangerous Waste," subsection (2)(a) or, in the case of debris [WAC 173-303-071, "Excluded Categories of Waste," subsection (3)(qq)(ii)] and environmental media (Compendium letter 3610.930219, "Contained-in Policy") to which the "contained-in" regulations or policy apply, unless and until Ecology determines that the debris or environmental media do not or no longer contain dangerous waste. This is referred to as "clean closure."

Under WAC 173-303-640(8)(b), if an owner/operator demonstrates that it is not practicable to remove or decontaminate all contaminated soils (through the corrective action requirements) and/or tank structures at closure, the tank system must be closed in accordance with the closure and post-closure care requirements that apply to landfills as specified in WAC 173-303-665,

"Landfills," subsection (6). For the purposes of closure, post-closure, and financial responsibility such a tank system is then considered to be a landfill and the owner or operator also must meet all of the requirements for landfills specified in WAC 173-303-610 and WAC 173-303-620, "Financial Requirements" (if financial responsibility applies). This is referred to as "landfill closure" or "closure with waste in place." Note that, although the regulations at WAC 173-303-640(8)(b) identify only consideration of "contaminated soil," generally landfill closure is required any time that unit structures, equipment, containment systems, or environmental media cannot be removed or decontaminated to clean closure levels.

The Ecology clean closure guidance specifies "If it is not possible to remove or decontaminate all unit structures, equipment, containment systems, and other material (including environmental media) affected by releases at or from a closing unit, long-term cleanup and care of the unit will be required consistent with the requirements for post-closure care" (Publication #94-111, *Guidance for Clean Closure of Dangerous Waste Units and Facilities*, page 55). This is consistent with the approach to closure of tank systems required by the U.S. Environmental Protection Agency (EPA). In the preamble to the final rule on tank system closure, EPA explained: "As the final feature of these regulations, EPA is requiring owners or operators of hazardous waste tank systems to provide adequate closure, and, if necessary, post-closure care. All wastes and all contaminated components, soils, structures, and equipment must be decontaminated or removed from the site at closure. *If all contaminated components, soils, structures, and equipment cannot be decontaminated or removed at closure, or if the ground water is found to be contaminated, the site must be provided with post-closure care similar to that required for landfills.*" (interpreting the Federal equivalent of WAC 173-303-640(8)(b), see 51 FR 25436, "Hazardous Waste Management System; Standards for Hazardous Waste Storage and Treatment Tank Systems; Final rule," emphasis added).

If closure as a landfill is required, the tank system is then considered to be a landfill for purposes of closure, post-closure, and financial responsibility and all of the requirements for landfills in WAC 173-303-610 and WAC 173-303-620 must be met [WAC 173-303-640(8)(b)]. Because of the potential for leaks, owners/operators of tank systems that do not have secondary containment are required to prepare both a plan for clean closure and a contingent plan for closure as a landfill [WAC 173-303-640(8)(c)].

For the tank systems at Hanford, Ecology does not consider that the demonstration of practicability affects the existing requirements for retrieval.

6.0 REQUIREMENTS FOR CLEAN CLOSURE

In addition to compliance with the general closure performance standard, clean closure requires removal or decontamination of all dangerous waste, waste residues, and equipment, bases, liners, soils/subsoils and other materials containing or contaminated with dangerous waste or waste residue. Two conditions must be met to clean close:

(1) The concentrations of dangerous waste, dangerous waste constituents, and dangerous waste residues throughout the closing unit and throughout all areas and environmental media affected by releases from the closing unit do not exceed numeric cleanup levels

determined using unrestricted site use exposure assumptions under WAC 173-340, "Model Toxics Control Act — Cleanup" (MTCA). These often are referred to as "clean closure levels" [WAC 173-303-610(2)(b)(i)].

(2) All structures, equipment, bases, liners and other materials containing or contaminated with dangerous wastes, constituents, or residues have met specific removal and decontamination standards approved by Ecology in consideration of the closure performance standard. Ecology guidance on decontamination of structures, equipment, bases, etc., describes three options: (1) use the debris-specific, technology-based Alternative Treatment Standards for Hazardous Debris specified in Table 1 of Title 40, *Code of Federal Regulations*, Part 268.45, "Treatment Standards for Hazardous Debris" [incorporated into the Dangerous Waste Regulations at WAC 173-303-140, "Land Disposal Restrictions," subsection (2)(a)] and meet the appropriate debris-specific performance standards specified therein; (2) propose and obtain Ecology approval of a site-specific decontamination method and performance standard; or (3) meet MTCA residential cleanup levels in the debris (Publication #94-111, Section 5.3).

Note that, as with contaminated environmental media, Ecology also has the ability to determine that debris does not or no longer contains dangerous waste. According to the Clean Closure Guidance, Ecology typically will base contained-in determinations for debris on the history of the unit undergoing closure (i.e., what dangerous waste constituents may have come in contact with the debris), the concentrations of dangerous constituents present, potential routes of exposure to such constituents and other applicable information. There are no numeric standards routinely used to define the concentrations at which debris does not or no longer contains dangerous waste, although Ecology guidance is that MTCA soil cleanup levels calculated using unrestricted site use exposure assumptions represent a very conservative assessment of the potential risks posed by debris and if constituent concentrations are below these levels Ecology generally will determine that debris do not contain dangerous waste [see WAC 173-303-071(3)(qq)(ii) and Publication #94-111, page 20].

For dangerous waste treatment and storage tank systems the presumption is that all waste and waste residue will be removed at closure and that any structures, ancillary equipment, and areas affected by releases from the tank system can be removed or decontaminated so that clean closure can occur. In some cases, particularly with tank systems that have leaked, it may not be practicable to remove or decontaminate all structures, equipment, containment systems, and other material (including environmental media such as contaminated soil) at closure. In these cases, the tank system must be closed as a landfill [WAC 173-303-640(8)(b)]. Because of the potential for leaks, owners/operators of tank systems that do not have secondary containment are required to prepare both a plan for clean closure and a contingent plan for closure as a landfill [WAC 173-303-640(8)(c)].

7.0 REQUIREMENTS FOR LANDFILL CLOSURE

Landfill closure was designed for dangerous waste TSD units for which there is a presumption that waste will remain in place after closure. These units include dangerous waste landfills and,

under some circumstances, surface impoundments and waste piles. The requirements for landfill closure also apply to dangerous waste tank systems when it is not practicable to remove or decontaminate all contaminated structures, equipment, containment systems and other material (including environmental media) affected by releases from the unit.

In addition to compliance with the closure performance standard, landfill closure requires that the affected area be covered with a final cover (i.e., barrier or cap) designed and constructed to:

(1) provide long-term minimization of migration of liquids through the closed landfill;

(2) function with minimum maintenance;

(3) promote drainage and minimize erosion and abrasion of the cover;

(4) accommodate settling and subsidence so that the cover's integrity is maintained; and

(5) have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

Once the cover is in place, units that are closed as landfills must be monitored as part of "post-closure care." The purpose of post-closure care is to ensure that caps or covers function as intended and that dangerous waste remains sufficiently contained so as to protect human health and the environment. At a minimum, post-closure care monitoring includes groundwater monitoring as required by (as applicable) WAC 173-303-645, "Releases from Regulated Units," WAC 173-303-650, "Surface Impoundments," WAC 173-303-655, "Land Treatment," WAC 173-303-660, "Waste Piles," WAC 173-303-665, and WAC 173-303-680, "Miscellaneous Units." Post-closure care generally is required for 30 years, although a shorter or longer period may be specified in accordance with WAC 173-303-610(7)(b) as necessary to protect human health and the environment.

It is important to recognize that (except for units that were designed as dangerous waste landfills and operated for that purpose), even landfill closure may involve removal of dangerous waste and waste residues and some removal and/or decontamination of unit structures, ancillary equipment, or contaminated environmental media to meet the general closure performance standard. During landfill closure, Ecology works with owners/operators to determine the amount of removal and decontamination that is needed to meet the general closure performance standard.

8.0 MAKING THE PRACTICABILITY DETERMINATION FOR CLEAN CLOSURE

One of the key questions for closure of SSTs at Hanford is whether removal or decontamination of all structures, equipment, containment systems and other material (including environmental media) affected by the closing unit (i.e., clean closure) is "practicable" under the Dangerous Waste Regulations.

As described earlier, Ecology's guidance on clean closure of dangerous waste management units (Publication #94-111) states that "if it is not possible to remove or decontaminate all unit

structures, equipment, containment systems, and other material (including environmental media) affected by releases at or from a closing unit, long-term cleanup and care of the unit will be required consistent with the requirements for post-closure care." However, specific guidance on the details of a practicability determination is not provided. Federal regulations and guidance on RCRA closures are similarly silent on the details of a practicability determination during closure. In the absence of existing regulation or guidance, Ecology must make practicability determinations on a case-by-case basis. Existing standards for practicability determinations might inform these decisions.

9.0 EXISTING STANDARDS AND DEFINITIONS FOR PRACTICABLE

A number of existing definitions and standards, particularly those from closely related environmental programs, might guide Ecology in making a practicability determination for dangerous waste tank systems.

9.1 DICTIONARY DEFINITION

The Oxford English Dictionary defines "practicable" as "able to put into practice; able to be effected, accomplished, or done, feasible."

9.2 DEFINITION FROM MODEL TOXICS CONTROL ACT

Washington State has defined "practicable" for purposes of making decisions under the State cleanup program. In MTCA subsection WAC 173-340-200, "Definitions," "practicable" is defined as "capable of being designed, constructed and implemented in a reliable and effective manner including consideration of cost. When considering cost under this analysis, an alternative shall not be considered practicable if the incremental costs of the alternative are disproportionate to the incremental degree of benefits provided by the alternative over other lower cost alternatives."

The MTCA offers specific standards for determination of disproportionate costs. Under MTCA, costs are disproportionate to benefits if the incremental costs of the alternative over that of a lower cost alternative exceed the incremental degree of benefits achieved by the alternative over that of the other lower cost alternative [WAC 173-340-360, "Selection of Cleanup Actions," subsection (3)(e)(i)].

Ecology is responsible for weighing costs and benefits in evaluating a disproportionate cost analysis and making the final decision about disproportionate costs. This involves ranking alternatives from most to least permanent and using the most practicable permanent solution as the baseline cleanup action alternative against which other alternatives are compared. The comparison of benefits and costs may be quantitative, but often will be qualitative and require the use of best professional judgment. In particular, Ecology has the discretion to favor or

disfavor qualitative benefits and use that information in selecting a cleanup action [WAC 173-340-360(3)(e)(ii)].

The MTCA specifies seven criteria that should be used to evaluate and compare protective cleanup alternatives when conducting a disproportionate cost analysis under MTCA, which are: protectiveness, permanence, cost, effectiveness over the long term, management of short-term risks, technical and administrative implementability, and consideration of public concerns [WAC 173-340-360(3)(f)].

9.3 U.S. ENVIRONMENTAL PROTECTION AGENCY GUIDANCE ON TECHNICAL IMPRACTICABILITY DETERMINATIONS FOR *RESOURCE CONSERVATION AND RECOVERY ACT OF 1976* CORRECTIVE ACTIONS

Long-standing EPA policy defines technical impracticability for contaminated groundwater as a situation where achieving groundwater cleanups associated with final cleanup goals is not practicable from an engineering perspective. "Engineering perspective" refers to factors such as feasibility, reliability, scale or magnitude of a project, and safety. For example, a certain cleanup approach might be technically possible, but the scale of the operation might be of such magnitude that is not technically practicable. In the Superfund context, EPA has stated that cost can be considered in evaluating technical impracticability, although it should generally play a subordinate role and should not be a major factor unless compliance would be inordinately costly (55 FR 8748, "National Oil and Hazardous Substances Pollution Contingency Plan; Final rule").

EPA530-R-04-030, *Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action* lists a number of factors that generally should be included in a technical impracticability evaluation. Other information may be required by the State or Federal cleanup program overseeing the corrective action:

- spatial area over which the technical impracticability decision would apply
- specific groundwater cleanup levels, consistent with the groundwater use designation that is considered technically impracticable to achieve
- conceptual site model that describes geology, hydrology, groundwater contamination sources, transport, and fate
- evaluation of the "restoration potential" of the technical impracticability zone
- cost estimates
- description of an alternative remedial strategy.

While likely not directly transferable to a closure situation, these factors may provide guidelines for the types of information that could be used to evaluate whether removal or decontamination to clean closure standards is practicable. For example, the area over which a practicability

determination would apply would be the tank system undergoing closure. Decontamination standards and clean closure levels for environmental media are described in Ecology's clean closure guidance. If removal or decontamination to these standards is determined not to be practicable, the alternative remedy strategy would involve meeting the general closure performance standard and capping and monitoring the tank system in accordance with the requirements for closure and post-closure care for hazardous waste landfills.

9.4 CONCEPT OF IMPLEMENTABILITY AS A REMEDY SELECTION CRITERION

State and EPA cleanup programs such as the RCRA corrective action program and the Superfund program use a series of balancing criteria to select between protective remedies. In the RCRA corrective action and Superfund programs, there are five primary balancing criteria.

1. Long-term effectiveness and permanence, which refers to the ability of a remedy to maintain reliable protections of human health and the environment over time once cleanup goals have been met.

2. Reduction of toxicity, mobility, or volume through treatment, which considers the anticipated performance of the potential treatment technologies that a remedy might employ.

3. Short-term effectiveness, which addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

4. Implementability, which considers the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

5. Cost, which refers to estimated capital and operation and maintenance costs using net present worth value.

These are consistent with the criteria used to evaluate and compare protective cleanup alternatives when conducting a disproportionate cost analysis under MTCA, which are: protectiveness, permanence, cost, effectiveness over the long term, management of short-term risks, technical and administrative implementability, and consideration of public concerns [WAC 173-340-360(3)(f)].

The concept of implementability may be particularly relevant to determining if removal or decontamination to clean closure standards is practicable, because of the similarity of these two concepts. The EPA guidance from the Superfund program describes consideration of implementability as particularly important for balancing between protective remedies at sites with highly heterogeneous wastes or media that make the performance of certain technologies highly uncertain (in the case of a tank system, closure will involve either removal or

decontamination to clean closure standards or, if removal and decontamination is not practicable, closure as a hazardous waste landfill; while different, both of these approaches are considered protective). Implementability also is described as significant when evaluating technologies that are less proven and remedies that are dependent on a limited supply of facilities (e.g., landfills permitted through *Toxic Substances Control Act of 1976*), equipment (e.g., in-situ vitrification units) or experts (OSWER Directive 9355.0-27FS, *A Guide to Selecting Superfund Remedial Actions*). In the RCRA corrective action program, the same balancing criteria are used when selecting among protective remedies (61 FR 19449, "Corrective Action for Releases from Solid Waste Management Units at Hazardous Waste Management Facilities; Advance notice of proposed rulemaking"). The MTCA describes technical and administrative implementability as "Ability to be implemented including consideration of whether the alternative is technically possible, availability of necessary off-site facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions" [WAC 173-340-360(3)(f)(vi)].

9.5 SUMMARY

In summary, existing guidance points to consideration of the following elements during evaluation of whether removal and decontamination to clean closure standards is practicable:

- the area over which the determination would apply and specific numeric criteria that would need to be met for removal and decontamination to meet clean closure requirements

- the technological feasibility of removal and decontamination to clean closure standards, including consideration of availability of treatment/disposal technologies and space, risks to workers, and available expertise

- whether removal and decontamination to clean closure standards would result in disproportionate costs as defined by MTCA

- the alternative approach that will be used to ensure that the general closure performance standard is achieved, including compliance with existing retrieval requirements and description of any additional removal and decontamination of contaminated ancillary equipment or other unit components or structures, or contaminated environmental media affected by releases from the unit that will be carried out to support compliance with the general closure performance standard during closure with waste in place.

Note that, as described earlier in this document, for the tank systems at Hanford, Ecology does not consider the demonstration of practicability affecting the existing requirements for retrieval. Ecology's expectation is that retrieval will be completed regardless of whether it is subsequently practicable to fully remove or decontaminate any remaining waste residuals, contaminated ancillary equipment or other unit components or structures, or contaminated environmental media affected by releases from the unit. This is consistent with WAC 173-303-640(8)(b) and

existing guidance, which contemplate considering, at most, "unit structures, equipment, containment systems, and other material (including environmental media) affected by releases at or from a closing unit." (Publication #94-111, page 55).

9.6 KEY POLICY DETERMINATION

Under WAC 173-303-640(8)(b), the "owner or operator" is responsible for making the "demonstration that not all contaminated soils can be practicably removed or decontaminated at closure." For the SST System and associated environmental media, this demonstration will be developed as a submittal for permit modification to the SST System closure plan.

The demonstration will largely be based on the M-045-80 Milestone, Task 3, "a tank removal engineering study," which, in accordance with the RPP-PLAN-46484, *Waste Management Area C Closure Demonstration Project Plan*, will evaluate the ability to remove 100-series tanks in WMA C after retrieval. The demonstration may include other evaluations such as an evaluation of the ability to remove all contaminated soil in WMA C. The development of this demonstration will occur in a collaborative manner between Ecology, the U.S. Department of Energy Office of River Protection, and its contractor and the final demonstration will become part of an Office of River Protection closure plan application that will be submitted to Ecology.

Evaluation of removal of discrete areas of soil or portions of the tank system that are deemed to be required for further protection of human health and the environment will occur as part of the RCRA Corrective Measures Study and component closure plan applications, respectively, should landfill closure be selected.

10.0 APPLICATION OF LAND DISPOSAL RESTRICTION TREATMENT STANDARDS DURING CLOSURE FOR TANK SYSTEMS

10.1 APPLICATION OF LAND DISPOSAL RESTRICTION TREATMENT STANDARDS DURING CLOSURE

If it is ultimately determined that clean closure is not practicable for SSTs, consideration must be given to application of land disposal restriction treatment standards (LDRs) to any residuals that will remain in place after closure. The SSTs are considered storage units; however, if it is determined that removal and decontamination to clean closure standards is not practicable, the tank system must be closed as a landfill, with waste left in place.

There is no specific guidance that deals with application of LDRs to any waste residuals remaining in tank systems that are closed as landfills due to determination that clean closure is impracticable. Ecology's regulations on land disposal restrictions are found at WAC 173-303-140 and, in general, incorporate by reference the Federal land disposal restriction program in Title 40, *Code of Federal Regulations*, Part 268, "Land Disposal Restrictions."

A number of existing regulations and guidance might be used to inform interpretation of these requirements.

10.2 CONCEPT OF PLACEMENT

Land disposal restriction treatment standards apply only to placement of prohibited waste in a land disposal unit. The EPA has published extensive guidance on application of the concept of placement in determining when LDRs apply. The most complete discussion is in the preamble to the 1998 regulation on LDRs for contaminated soil, in which EPA articulated three principles that informed the policy decisions in the regulation. Although these principles are articulated in the context of contaminated soil, they flow from more overarching policy decisions in the land disposal restriction program. The principles are:

1. Land disposal restrictions only attach to prohibited hazardous waste (or hazardous contaminated soil) when it is (1) generated and (2) placed in a land disposal unit. Therefore, if contaminated soil is not removed from the land (i.e., generated), LDRs cannot apply. Similarly, if contaminated soil is removed from the land (i.e., generated) yet never placed in a land disposal unit LDRs cannot apply. In other words, LDRs do not apply to contaminated soil in situ or force excavation of contaminated soil.

2. Once a decision has been made to generate and re-land-dispose contaminated soils, LDRs generally only apply to contaminated soils that contain hazardous waste.

3. Once LDRs attach (generally at the point of generation) to any given hazardous waste or volume of hazardous contaminated soil, the LDR treatment standards continue to apply until they are met (63 FR 28617, "Land Disposal Restrictions Phase IV: Final Rule Promulgating Treatment Standards for Metal Wastes and Mineral Processing Wastes; Mineral Processing Secondary Materials and Bevill Exclusion Issues; Treatment Standards for Hazardous Soils, and Exclusion of Recycled Wood Preserving Wastewaters; Final rule").

10.3 THE AREA OF CONTAMINATION POLICY

The Area of Contamination (AOC) Policy originates from application of the concept of placement to determine when land disposal restrictions apply. Under the AOC policy, hazardous waste (and hazardous contaminated soil) can be consolidated, treated in situ, or left in place without triggering a duty to comply with land disposal restriction treatment standards (55 FR 8758, "Final National Contingency Plan;" 63 FR 28556, "Land Disposal Restrictions Phase IV: Final Rule Promulgating Treatment Standards for Metal Wastes and Mineral Processing Wastes; Mineral Processing Secondary Materials and Bevill Exclusion Issues; Treatment Standards for Hazardous Soils, and Exclusion of Recycled Wood Preserving Wastewaters, Final Rule"). In an August 1992 Fact Sheet (Memorandum 9502.1992(02), "Use of Corrective Action Management Unit (CAMU) Concept") further describing use of the AOC policy, EPA stated specifically that an AOC could include specific subunits, although, if the

subunit were a RCRA unit (such as a landfill), inclusion of the unit within an AOC would not remove the requirements (such as closure and post-closure care) that otherwise would apply to the unit. Activities that constitute treatment, if conducted, remain subject to applicable permitting requirements whether or not placement occurs and whether or not they occur within an AOC.

If the tank system is closed as a landfill because removal or decontamination to clean closure standards is determined not to be practicable, it seems that the AOC policy might be applied to any consolidation or in situ stabilization or other treatment that may be needed to satisfy the general closure performance standard; that is, permitting requirements would apply to treatment, but LDR treatment standards would not apply because placement is not occurring. The Ecology AOC policy is consistent with EPA's policy, although the Ecology policy specifies that typically, Ecology expects to review and approve AOC determinations (Ecology 1991, "Inter-program Policy Memorandum on Contamination, Washington State Department of Ecology Toxics Cleanup Program"). The AOC policy is consistent with the long-standing practice of allowing movement and consolidation of wastes within hazardous waste units during closure without triggering a duty to comply with LDR treatment requirements. The AOC policy is consistent with the long-standing practice of allowing movement and consolidation of wastes within hazardous waste units during closure without triggering a duty to comply with LDR treatment requirements (Memorandum EPA 1996, "Use of the Area of Contamination (AOC) Concept During RCRA Cleanups").

10.4 LAND DISPOSAL RESTRICTION TREATABILITY VARIANCE

At closure, the tank systems will have already been retrieved (i.e., wastes and residuals removed) to the extent of available technology – so additional removal of wastes and residuals for subsequent treatment and placement seems unlikely. If Ecology determines that LDRs apply to waste residuals or other wastes or contaminated soils that cannot practically be removed or decontaminated at closure,[6] the Department likely will be faced with considering a site-specific land disposal restriction treatability variance. Such site-specific variances can be used to establish site-specific treatment standards when the nationally applicable treatment standard is unachievable or inappropriate. Public notice and a reasonable opportunity for public comment must be provided, although EPA guidance is to combine such public notice with other public involvement activities that are typically part of remediation. Additional guidance on site-specific LDR treatability variances is available in Memorandum EPA 1997, "Use of Site-Specific Land Disposal Restriction Treatability Variances under 40 CFR 268.44(h) During Cleanups."

[6] This would require Ecology to determine that a decision that full removal and decontamination to clean closure standards is not practicable and, therefore, tank systems must be closed as landfills, which would constitute an act of "placement" thus triggering a duty to comply with LDR treatment standards.

10.5 KEY POLICY QUESTION

If it is determined that removal of all contaminated soil is not practical and the tank system is therefore closed as a landfill, do LDR treatment standards apply to waste residuals left in tanks or ancillary equipment?

11.0 CLOSURE OF THE SINGLE-SHELL TANK SYSTEM AT HANFORD

At Hanford, closure requirements are described in the HFFACO and in the Hanford Facility Dangerous Waste Permit. Closure of SST farms is addressed in Milestone M-045-00 of HFFACO.

Closure planning for SSTs is occurring in parallel with waste retrieval. Closure planning involves three levels of plans. The highest-level plan (Tier 1) documents requirements that apply to the SST system overall. It is commonly referred to as the "Framework Plan." Mid-level plans (Tier 2) document requirements for each of the seven specific SST WMAs and are referred to as "WMA Closure Action Plans." The lowest-level plans (Tier 3) document requirements for closure of individual SSTs, components (e.g., vaults and pump pits), and ancillary equipment (e.g., piping) within each WMA and are referred to as "Component Closure Activity Plans."

Closure also is addressed in Sections II.J and II.K of the Hanford Facility Dangerous Waste Permit which describe the overall requirements for closure and the process for approval of closure and post-closure activities. Unit-specific closure requirements for TSD units are addressed in Parts III (for final status operations), V (units undergoing closure) and/or VI (units in post-closure) of the Hanford Facility Dangerous Waste Permit, depending on the operating status of the unit and the type of closure that is carried out, by incorporating closure plans into the Hanford Facility Dangerous Waste Permit.

The SST System closure requirements will be placed into Part V of the Hanford Facility Dangerous Waste Permit and will describe the overall requirements for closure and the process for approval of closure and post-closure activities. It will contain requirements for operations, closure, post-closure, and environmental media corrective action.

12.0 CORRECTIVE ACTIONS FOR ENVIRONMENTAL MEDIA CONTAMINATED BY THE SINGLE-SHELL TANK SYSTEM

As discussed previously, corrective actions for contaminated soil and groundwater will be required to close the SST WMAs. Specific requirements for corrective measures will be identified in Part V of the Hanford Facility Dangerous Waste Permit. In addition, the HFFACO contains milestones for soil corrective actions and includes development of characterization information through a RCRA Facility Investigation/Corrective Measures Study Work Plan, evaluation of corrective measures in a Corrective Measures Study, and development of corrective measure design requirements in a Corrective Measure Implementation Plan.

Groundwater corrective actions will be coordinated in the Hanford Facility Dangerous Waste Permit with *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) groundwater actions as described in Appendix I of the HFFACO. Compliance with RCRA groundwater protection standards will be a requirement of the final remedy for groundwater contaminated by the SST System. Post-closure monitoring of groundwater to evaluate the effectiveness of the groundwater and soil remedy is expected to be a requirement of the CERCLA Record of Decision as well as the Hanford Facility Dangerous Waste Permit.

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