

APPENDIX I – SINGLE-SHELL TANK SYSTEM WASTE RETRIEVAL AND CLOSURE PROCESS

1.0 PURPOSE AND INTRODUCTION

The purpose of this Agreement Appendix I is to:

1. Document the process DOE is required to use to close DOE's SST system (i.e., the SSTs themselves; and associated ancillary equipment including waste transfer piping, valve pits, vaults, etc.; contaminated soils, and contaminated groundwater¹) including the retrieval of tank wastes. The major phases of this closure process under the HWMA are: Tank waste retrieval; SST system, WMA and component closure including WMA corrective actions; and groundwater actions. Groundwater remedial actions and investigations will be conducted under past practice authority consistent with the Hanford Site Wide RCRA permit condition II.Y.2 and WAC 173-303-645. Groundwater investigations conducted under past practice authority will be coordinated with any investigations that may be conducted as part of the SST corrective action/closure process. The process also documents the Parties' recognition that SST WMA closure and other Central Plateau waste site cleanup activities via compliance with federal and state requirements need integration² (reference Agreement Section 5.5). Specific SST WMA closure objectives and standards will be delineated in *Hazardous Waste Management Act* (HWMA) closure plans.
2. To establish and document the agencies' waste retrieval and closure process consistent with that defined in Washington Administrative Code (WAC) 173-303-610 and -640 for closure of all DOE's SST systems (tanks, ancillary equipment, soil, and groundwater).

DOE, Ecology and EPA expect that this process will standardize Agreement requirements for SST system closure and to support future post-closure requirements. The process requires the submittal of Agreement primary documents that establish enforceable requirements and schedules in lieu of multiple Agreement milestones. This process further serves as a mechanism to identify and establish requirements to be used throughout the SST system. These requirements include:

- Creating criteria to be used to define the sequence of SSTs selected for retrieval and subsequent closure actions, and
- The process to be utilized in retrieving wastes and closing components of the SST system.

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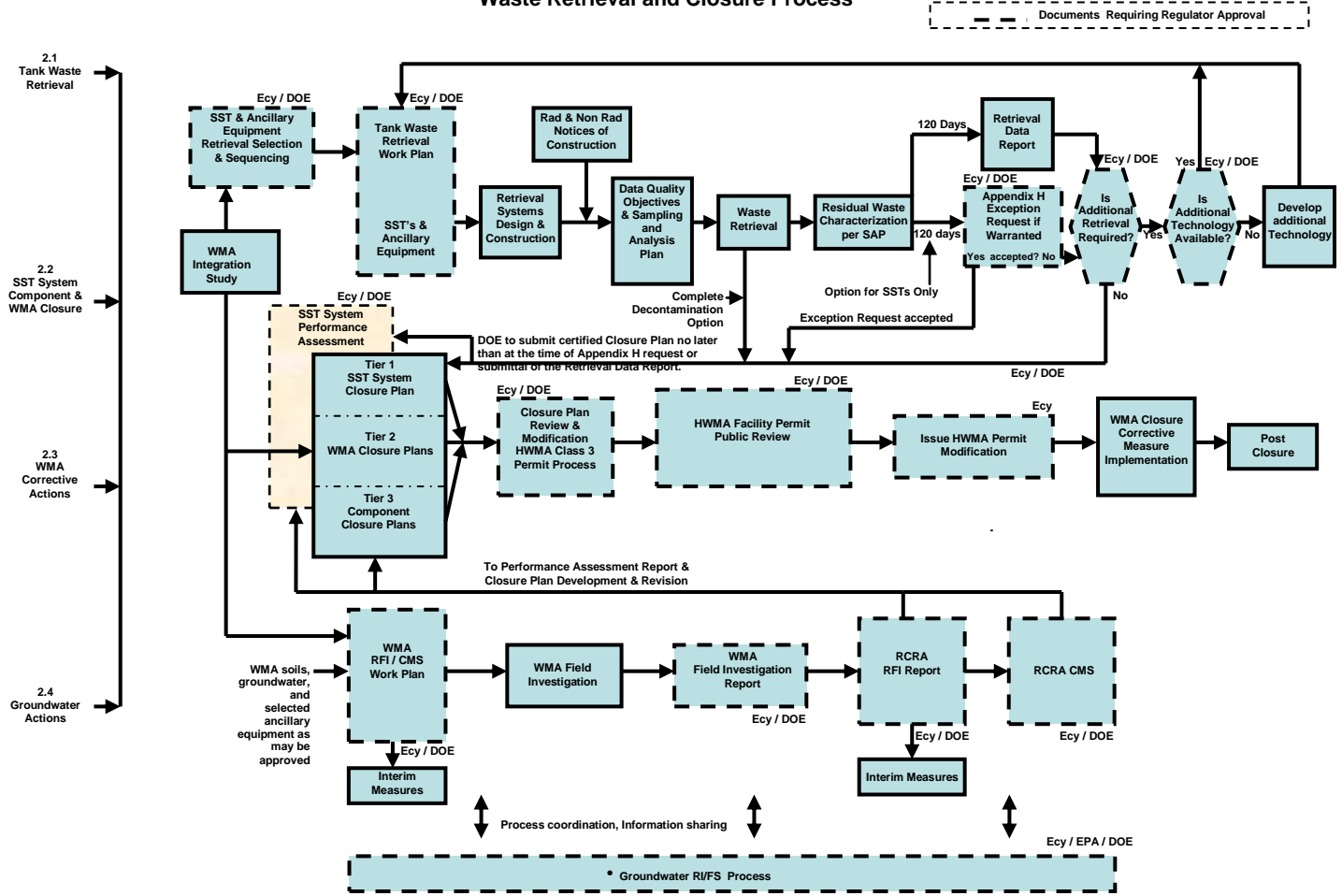
Figure I-1 depicts the process DOE is required to follow during SST WMA waste retrieval and closure. It identifies four main areas of emphasis: Tank waste retrieval; SST system, WMA and component closure, including WMA corrective action; and groundwater actions. These areas are discussed in greater detail in the following sections of this appendix. Each box within Figure I-1 identifies an action needed to achieve closure of the SST system. Actions or deliverables requiring approval by Ecology are identified.

¹ The DOE and Ecology have grouped the SST system into seven WMAs: WMA A-AX; WMA B-BX-BY; WMA C; WMA S-SX; WMA T; WMA TX-TY; and WMA U.

² For the purpose of this M-45-04-01 Change Request the terms integrate and integration mean to coordinate for the purposes of efficiency and effectiveness. Such terms have no effect on respective agency authority, requirements, or responsibilities.

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**Figure I-1.
Single-Shell Tank Waste Management Area (WMA)
Waste Retrieval and Closure Process**



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2.1 TANK WASTE RETRIEVAL

Waste retrieval is a major activity in the process of SST system closure. Criteria applicable to SST waste retrieval activities, as stated in Milestone M-45-00, are: “...retrieval of as much waste as technically possible, with tank residues not to exceed 360 cubic feet (cu. ft.) in each of the 100-series tanks, 30 cu. ft. in each of the 200-series tanks, or the limit of waste retrieval technology capability, whichever is less.” If these waste retrieval criteria are not met for a specific tank using the selected technology(s), DOE may use the procedure delineated in Agreement Appendix H to request Ecology approval of an exception to the waste retrieval criteria for that specific tank. This section shall not apply to the 19 SSTs covered by the Consent Decree in *Washington v. DOE*, Case No. 08-5085-FVS, except as set forth in Appendix C, Part 3, A.1 and A.2 of such decree.

The Parties’ waste retrieval and closure process is described in the following sections:

2.1.1 Waste Management Area Integration Study

For each SST tank farm (or WMA), DOE shall submit a WMA integration study. This study shall look at the entire WMA from a system perspective and describe the inter-relationships between the various components. The study shall describe a logical sequence of events that would lead to efficient and effective waste retrieval and closure of the WMA, including field sampling and characterization activities of the ancillary equipment (piping, valve pits, vaults, IMUSTs, diversion boxes, etc.). This study will be used in the development of the WMA closure plan. The document will propose a regulatory path for all ancillary equipment in that WMA and all the activities to achieve efficient and effective closure of that WMA, including:

- SSTs
- SST system ancillary equipment
- Soil remediation per WMA corrective actions and proposed plans for WMA soils
- Activities necessary for integration with Central Plateau groundwater remediation.

It is anticipated that tank waste will need to be retrieved from ancillary equipment in order to meet the closure requirements of WAC 173-303-610 and -640. The criteria for these retrievals will be governed by those regulations.

The submittal of WMA integration studies will be scheduled through the Milestone M-45 series.

2.1.2 Tank Retrieval Selection and Sequencing

The initial phase of SST system tank waste retrieval extends to that point in time when double-shell tank (DST) waste begins to be transferred to the WTP pursuant to Milestone M-62-09. During this phase, DST capacity will be a major factor in DOE’s ability to retrieve SST waste. DOE will perform space acquisition and/or optimization activities as required by the Agreement’s Milestone M-46 series in order to maximize available DST space. In addition, DOE will perform SST tank waste retrievals to maximally utilize DST space available for retrieval. The second phase of waste retrieval begins when DST capacity is again made available (to receive more SST waste) as DST waste is transferred to WTP for treatment.

SST tank waste retrieval selection and sequencing will be performed on a biennial basis in accordance with the following steps:

- DOE will develop its SST tank retrieval selection and sequence document as a primary document for approval by Ecology in accordance with the Milestone M-45-02 series. The pool of tanks

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selected by this document will be used as the starting point for selecting and scheduling the following two years' tank waste retrieval activities

- The primary objectives and prioritization criteria for SST tank retrieval selection and sequence are to maximize the reduction of short-term and long-term risk to human health and the environment, and to optimize waste feed so as to maintain efficient WTP operations
- Additional criteria that will be considered in tank selection and that may result in lower risk tanks being retrieved first, include:
 - Worker safety
 - Supporting the completion of WMA closures
 - The optimization of DST space utilization considering resource leveling and waste transfer infrastructure
 - Waste retrieval and closure requirements for associated ancillary equipment.
- Annually, the Parties will agree on which SSTs are to be retrieved during the coming year from the pool of tanks approved by Ecology through the SST tank retrieval selection and sequencing document
- To maintain optimal operational efficiency, DOE may request approval of changes to the selection of tanks to be retrieved in a certain year. In such cases DOE will propose the new tank(s) from the pool approved by Ecology in the tank sequencing and selection document.

2.1.3 Tank Waste Retrieval Work Plans

Tank waste retrieval work plans (TWRWP) will be submitted to Ecology as Agreement primary documents for a tank or set of tanks and their associated ancillary equipment. TWRWPs may cover tanks, tanks and associated ancillary equipment, or ancillary equipment alone (as may be required). TWRWPs will address only those actions associated with waste retrieval. Processes not covered by a TWRWP will be addressed by separate permitting actions as applicable. These TWRWPs, although expanded in scope by this Appendix I, were formerly identified as the Parties' functions and requirements documents in the various Milestone M-45 series. Work plans will include the following information:

- Tank(s) and/or ancillary equipment condition and configuration
- Retrieval technology or technologies and rationale for selection to meet Agreement Milestone M-45-00 criteria for tanks and regulatory requirements for ancillary equipment
- Leak detection monitoring and mitigation (LDMM) plan, including technology description, rationale for selection, configuration, inspection and monitoring requirements, mitigation response, and anticipated performance goals
- Operational requirements during retrieval
- A pre-retrieval risk assessment of potential residuals, consideration of past leaks, and potential leaks during retrieval, based on available data and the most sophisticated analysis available at the time. The purpose of this risk assessment is to aid operational decisions during retrieval activities. This risk assessment will not be used to make final retrieval or closure decisions. Minimally it will contain the following:
 - Long-term human health risks associated with potential leaks during retrieval and potential residual waste after completion of retrieval:
 - Potential impacts to groundwater, including a WMA-level risk assessment
 - Potential impacts based on an intruder scenario.
 - Process management responses to a leak during retrieval and estimated potential leak volume
 - The pre-retrieval risk analysis will be based on the following criteria:
 - Using the WMA fence line for point of compliance
 - Identify the primary indicator contaminants (accounting for at least 95% of impact to groundwater risk) and provide the incremental lifetime cancer risk (ILCR) and hazard index (HI)
 - Using ILCR and HI for the industrial and residential human scenarios as the risk metric

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- Calculated concentration(s) of primary indicator contaminant(s) in groundwater (mg/L, and pCi/L).
- Functions and associated requirements necessary to support design of proposed waste retrieval and LDMM system(s)
- Preliminary isolation evaluation including list of ancillary equipment associated with the specific component, plans for ancillary equipment removal or waste retrieval, available characterization information for waste contained within ancillary equipment, and anticipated interrelated impacts of various retrieval actions
- Retrieval start dates for each component.

Submittal of the TWRWP will be accompanied by a provisional schedule for informational purposes. The provisional schedule will include design, construction, and field retrieval activities.

Any TWRWP that identifies the use of new aboveground tanks, tank systems or treatment systems (not otherwise permitted), will require the following additional information:

- General arrangement diagrams
- System description
- Piping and instrumentation drawings (P&ID) for the retrieval system
- Process flow diagrams
- Information to demonstrate compliance with WAC 173-303-640
- Describe the disposition of the system at completion of the retrieval.

These new aboveground tanks, tank systems or treatment systems may be operated only during the retrieval duration.

DOE will not begin retrieval activities (i.e. start of the retrieval system installation) until the TWRWP for a particular tank or component has been approved by Ecology, or a separate approval has been requested by DOE and given by Ecology. SST waste retrieval will be completed to achieve Agreement criteria within 12 months of the start date(s) established in the TWRWP. The Parties' working assumption is that upon completion of the work described in the TWRWP, DOE will have met the tank waste retrieval criteria of Milestone M-45-00 for tanks, and the regulatory requirements for ancillary equipment.

The Parties recognize that DOE may be required by Ecology to perform additional retrieval activities depending on the results of the initial retrieval activities, residual waste characterization and risk assessments, or in the event of Ecology disapproval of a request for an exception under Appendix H. Ecology reserves the right to require additional retrieval activities if necessary.

2.1.4 Retrieval System(s) Design & Construction

After selecting the waste retrieval technology or technologies for a tank, group of tanks, and/or ancillary equipment, DOE will complete the design and construction of the retrieval system(s) based on the functions and requirements developed in the TWRWP. This retrieval system design will include as a minimum:

- Final design specifications
- Quality assurance process
- Acceptance test plans and operational test plans
- Process control plan.

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2.1.5 Waste Retrieval

Field retrieval activities will be started consistent with the requirements and retrieval start dates approved in the TWRWP. DOE will implement all the requirements, processes and schedules approved in the TWRWP, including LDMM activities, throughout the retrieval.

DOE will complete SST waste retrieval activities meeting Agreement criteria of Milestone M-45-00, and ancillary equipment waste retrieval activities meeting regulatory requirements, within 12 months of the retrieval start date(s) approved in the TWRWP.

2.1.6 Residual Tank Waste Characterization

Before tank waste field retrieval activities are initiated, DOE will develop a tank or component specific retrieval data quality objectives (DQO) document for the residual tank waste characterization in coordination with Ecology. As part of the DQO process, DOE will also develop a sampling and analysis plan for post-retrieval and closure sampling.

2.1.7 Retrieval Data Report/Appendix H Request for Exception

Once DOE has completed the retrieval actions described in the TWRWP, DOE will either complete and submit to Ecology within 120 days its retrieval data report, or a request for exception to retrieval criteria per Agreement Appendix H. The Appendix H option is only applicable for SSTs and the requirements of that request are identified in Agreement Appendix H, Attachment 2.

As a minimum, DOE's retrieval data report will include:

- Residual tank waste volume measurement, including associated calculations
- The results of residual tank waste characterization
- Retrieval technology performance documentation
- DOE's updated post-retrieval risk assessment
- Discussion of feasibility/viability of other available retrieval technologies, the feasibility of developing additional retrieval technologies, associated detailed cost estimates and amount of additional waste that could be removed
- Opportunities and actions being taken to refine or develop tank waste retrieval technologies, based on lessons learned
- LDMM monitoring and performance results
- DOE's recommendation for further action and proposed schedule(s).

Data from this report will be used by Ecology and DOE in making WMA-, tank-, and component-specific closure decisions. Single or multiple tank and component actions will be included in this report as appropriate.

2.2 SST SYSTEM COMPONENT AND WMA CLOSURE

2.2.1 SST System Closure Plan Development

As shown in Figure I-1, SST waste retrieval will occur prior to or in parallel with approval of modifications to the SST system closure plan. At the latest, DOE shall submit a certified component(s) closure activity plan with its retrieval data package or its Appendix H exception request. As noted in Sections 2.3 and 2.4, *Resource Conservation and Recovery Act of 1976* (RCRA) corrective action authority may be used to

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develop proposed final actions for some SST system components with approval to occur by Ecology through incorporation of the component closure plans into the Site-Wide Permit.

The SST system closure plan consists of three main sections that are arranged in a hierarchy. The highest-level plan (Tier 1) documents requirements pertaining to the SST system overall and is commonly referred to as the “Framework Plan.” Mid-level plans (Tier 2) document requirements pertaining to each of the seven SST WMAs and are termed WMA closure action plans. The lowest level plan (Tier 3) documents requirements pertaining to the closure of individual SSTs, and to the closure of individual ancillary equipment components within a particular WMA. These plans are termed component closure activity plans.

The Hanford Site Hazardous Waste Facility Permit modification process from submittal of initial plans (Revision 0) through public review and issuance of the modification is detailed in Agreement Section 9.2.2. It is expected that review time will become shorter as more SST waste retrieval and closure actions or sets of actions are completed due to experience gained and comparability of scope. Therefore, the Ecology and DOE may develop alternative schedules for permit processing to that appearing at Agreement Table 9-2. Agreements on any alternative schedules will be approved by the Ecology and DOE and included in the Administrative Record.

2.2.2 Ancillary Equipment Closure Actions

SST ancillary equipment will be closed in accordance with WAC 173-303-610 with associated requirements incorporated into the Site-Wide Permit through the component closure activity plans. Regulatory processes used to assess and develop necessary closure requirements for the wide range and location of ancillary equipment may differ depending upon efficiencies that may be gained through integration with other site activities. For example, large ancillary equipment such as vaults or IMUSTs are similar to SSTs and may contain a waste inventory requiring large-scale retrieval actions. Closure of these types of components is expected to be defined as part of a Tier 3 component closure activity plan. Closure of selected ancillary equipment components that are smaller, have less inventory, and that are closely coupled to actual or potential soil contamination may or may not be addressed through the corrective action process in association with adjacent contaminated soil (Section 2.3). Further, RCRA closure of ancillary equipment that is outside of a WMA boundary may or may not be as accomplished in tandem with the remedial action for the operable unit within which it resides. For example, where a *Comprehensive Environmental Response, Compensation and Liability Act of 1980* (CERCLA) action is occurring outside of a WMA, but within a large geographic area that also contains SST system ancillary equipment, it may be logical to clean up/close these components in coordination with the rest of the waste sites and structures in the area in accordance with the process described in Agreement Section 5.5. In all cases, SST ancillary equipment will be closed to meet the requirements of WAC 173-303-610. The closure decisions will be made through the component closure activity plans that are incorporated into the Site-Wide Permit.

The extent to which Ecology will use the RCRA corrective action process to fulfill the requirements of WAC 173-303-610 will be selected through approval of the WMA Closure Action Plans.

2.3 WMA CORRECTIVE ACTIONS

Closure decisions for SST system soils will be made through the RCRA corrective action process pursuant to Agreement Milestones M-45-55 through -62 and its established process for the development of interim measures where appropriate, RCRA facility investigation/corrective measures study (RFI/CMS) work plans, remedial field investigations, and corrective measures studies. It is expected that the Phase 1 corrective action process required by the specified milestones will result in adequate characterization to make final closure decisions. Ecology reserves the right to require additional

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characterization either through a Phase 2 corrective action process or through the development of a component closure activity plan if additional characterization is required.

A Phase 2 corrective action process Master Work Plan will describe the overall corrective action conceptual process and sequencing approach for all single shell tank farms. The milestones outlining defining the corrective action schedule for WMA C are shown in milestones M-45-60, -61, & -62. Elements of the Phase 2 Master Work Plan will include:

- Discussion of the approach to complete the Phase 2 data quality objective process including confirmation of developmental characterization tools such as high resolution resistivity (HRR or Subsurface Geophysical Evaluation [SGE]).
- Discussion of integration with the groundwater program, tank closure and adjacent operable units, as appropriate.
- Discussion of the WMA approach to corrective action and closure.
- Selection criteria for implementing Phase 2 RCRA corrective actions at subsequent WMAs.

It is expected that in some cases, the RCRA corrective action process will be used to investigate and analyze alternatives for remediation of selected soils/ancillary equipment. The regulatory process to be used to satisfy closure requirements for each ancillary equipment component will be selected through approval of the WMA closure action plan and incorporated into the Site-Wide Permit.

2.4 GROUNDWATER REMEDIAL ACTIONS

Ecology, as the lead agency for SST system closure, EPA, and DOE are electing to investigate and remediate groundwater under past practice authority. The information generated through the groundwater RI/FS or RFI/CMS process will be utilized in the development of SST system closure plans and performance assessment. Integration of CERCLA authority concurrently with RCRA closure and corrective action requirements, will allow Ecology and EPA to address all regulatory and environmental obligations associated with contaminated groundwater regardless of the types of contaminants of concern being addressed.

There are four past-practice operable units that are affected by DOE's SST system; 200-PO-1, 200-UP-1, 200-ZP-1 and 200-BP-5. Ecology, EPA and DOE agree that past-practice authority provides the most efficient means for addressing mixed-waste groundwater contamination plumes in these operable units which originate from a combination of TSD and past-practice units. However, in order to ensure that TSD units within the operable units are brought into compliance with RCRA and State of Washington hazardous waste regulations, Ecology intends, subject to part four of the Agreement, that all response or corrective actions, excluding situations where there is an imminent threat to the public health or environment as described in Section 7.2.3, will be conducted in a manner which ensures compliance with the technical requirements of the HWMA (Chapter 70.105 RCW and its implementation regulations). In any case, the Parties agree that CERCLA remedial actions will comply with requirements to meet applicable or relevant and appropriate requirements. Notwithstanding this operating assumption, Ecology reserves the right to require groundwater response actions consistent with Ecology's corrective action authority under the HWMA.

2.5 PERFORMANCE ASSESSMENT

Ecology, as the lead agency for SST system closure, EPA, and DOE have elected to develop and maintain as part of the SST system closure plan one performance assessment for the purposes of evaluating whether SST system closure conditions are protective of human health and the environment for all contaminants of concern, both radiological and nonradiological. DOE intends that this performance assessment (PA) will document by reference relevant performance requirements defined by RCRA, HWMA, *Clean Water Act*, *Safe Drinking Water*

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Act, and the *Atomic Energy Act of 1954* (AEA) and any other performance requirements that might be ARARs under CERCLA. The PA is of larger scope than a risk assessment required solely for nonradiological contaminants. The PA is expected to provide a single source of information that DOE can use to satisfy potentially duplicative functional and/or documentation requirements. A PA will be developed for each WMA and will incorporate the latest information available. These PAs will be approved by Ecology and DOE pursuant to their respective authorities. For Ecology approval means incorporation by reference, into the Site-Wide Permit through the closure plans.

As individual components are retrieved or characterized, or other component closure activities are completed, the resulting component characterization information will be incorporated into the WMA PA to determine its relative risk compared to the entire WMA performance. In doing this, the Parties will be able to make interim closure decisions for individual components. Initially, the WMAPA will be based on assumptions and available data describing component characterization information. As each WMA proceeds toward closure, its respective PA will be updated to address all pertinent new results and findings – and will, as a minimum, incorporate the following results as they become available: actual volumes of tank waste residuals left after retrieval, results of leak investigations, new geologic and ancillary equipment waste characterization information, and the results of new barrier and tank residual stabilization and fill performance studies and tests. Final WMA closure decisions will be made after all components are retrieved and/or characterized, and all other component closure activities have been completed and a final WMA PA is completed.

3.0 SST SYSTEM CLOSURE/INTEGRATION WITH OTHER CENTRAL PLATEAU ACTIVITIES

3.1 SST SYSTEM CLOSURE REGULATORY INTEGRATION STRATEGY

DOE is the responsible agency for the closure of all SST WMAs through post closure, in close coordination with other closure and cleanup activities of the Central Plateau. Washington State has a state program that is authorized under RCRA and implemented through the HWMA and its associated regulations; therefore, Ecology is the lead regulatory agency responsible for the closure of the SST system. EPA is the support regulatory agency providing oversight of the state's authorized program. The 200 Areas of the Hanford Site have been placed by EPA on the National Priorities List (NPL). The completion of remediation of the 200 Areas overall will eventually be finalized via CERCLA decisions made by the EPA, and permitting decisions made by Ecology.

The Parties acknowledge the need for SST system closure in a manner integrating RCRA treatment, storage, and disposal (TSD) closure requirements (including RCRA corrective action requirements), the closure requirements of the AEA, and Central Plateau CERCLA remedial action requirements in order to achieve a cohesive and effective approach to SST system closure ensuring that regulatory requirements are met. The Parties' expect that this Agreement Appendix I will incorporate Agreement Section 5.5 processes to provide a mechanism for avoiding duplicative regulation between Ecology and the EPA through the lead agency concept.

For the purpose of helping to ensure work is not inconsistent with future CERCLA remedial decisions, if any, Ecology is seeking the involvement of EPA pursuant to Agreement Action Plan Section 5.6 as the non-lead agency in Ecology's review of the performance assessment and SST system closure plan. Involvement with Ecology in conducting these reviews will provide EPA and DOE with a basis to evaluate whether closure is proceeding in a manner not inconsistent with what EPA expects would be required if the work was being conducted under CERCLA remedial authority.

EPA's involvement in these reviews will not constitute a decision under CERCLA. Based on EPA's involvement supporting Ecology review of the initial WMA performance assessment and WMA closure action plans, EPA will provide written comments to Ecology, made available to DOE, for the purpose described above, as well as to identify the need for additional work that EPA expects would be required if

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the work was being conducted under CERCLA remedial authority. EPA will evaluate the need to provide additional comments based on its review of proposed modifications to WMA closure action plans, and issue additional comments to Ecology as necessary.

3.2 INTEGRATION WITH CENTRAL PLATEAU REMEDIAL ACTIONS

The Parties will strive to integrate SST system closure actions with Central Plateau remedial actions. Integration will provide for protective, cost-effective site closure. Closure of SST system components such as ancillary equipment and soil contamination outside of WMAs will require close integration with decision making at adjacent sites. A consistent groundwater monitoring, protection, and risk assessment methodology will also be realized through close integration of activities, as described in the Hanford Site Groundwater Strategy (DOE/RL-2002-59). Consistent application of the requirements of this Appendix I will serve to aid the Parties in ensuring cost-effective and consistent cleanup on the Central Plateau. Central Plateau cleanup integration will also allow efficiencies through the coordination of operational interfaces on the Hanford Site.