ADDENDUM B

WASTE ANALYSIS PLAN

This page intentionally left blank.

TABLES

TERMS

AEA	*Atomic Energy Act of 1954*
AES	atomic emission spectrometer
ALARA	as low as reasonably achievable
CFR	*Code of Federal Regulation*s
CGM	combustible-gas meter
CVAA	cold vapor atomic absorption
DCRT	double-contained receiver tank
DOE	U.S. Department of Energy
DQO	data quality objective(s)
DST	double-shell tank
ECD	electron capture detector
ECO	Environmental Compliance Officer
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
GC/MS	gas chromatograph/mass spectrometer
GEA	gamma energy analysis
GFAA	graphite-furnace atomic absorption
GRE	gas release event
HFFACO	*Hanford Federal Facility Agreement and Consent Order* (frequently referred to as the TPA)
HEIS	Hanford Environmental Information System
ICP-MS	inductively coupled plasma mass spectrometer
IMUST	Inactive miscellaneous underground storage tank
LDR	land disposal restrictions
PCB	polychlorinated biphenyl
PUREX	Plutonium-Uranium Extraction (Plant)
QA	quality assurance
QC	quality control
RCRA	*Resource Conservation and Recovery Act of 1976*
SAP	Sampling and Analysis Plan
SST	single-shell tank
SVOC	semi-volatile organic compounds
TCD	Tank Characterization Database
TCP	Tank Characterization Plan
TCR	Tank Characterization Report
TIC	total inorganic carbon
TOC	total organic carbon
TSD	treatment, storage, and disposal
TWINS	Tank Waste Information Network System
WAC	*Washington Administrative Code*
WAP	Waste Analysis Plan
WSP	waste stream profile
WTP	Waste Treatment and Immobilization Plant

B.1 INTRODUCTION

The Double-Shell Tank (DST) System stores mixed waste until the waste is treated for final disposal in another treatment, storage, and disposal (TSD) unit. This document relies in part on the results of transfer specific waste compatibility assessments to determine the analyses necessary to ensure proper management of the waste. This DST System waste analysis plan (WAP) will be revised periodically to ensure it remains current. WAP revisions will require a permit modification pursuant to WAC 173-303-830.

B.1.1 Purpose

This WAP establishes sampling and analysis to meet waste acceptance criteria and to meet requirements contained in *Washington Administrative Code* (WAC) 173-303, "Dangerous Waste Regulations," Subparts -110, -300, -395, -640, and -806(4)(a)(ii) for the DST System unit. These regulations require that measures are taken to ensure that the proper waste has been received and that sufficient information is available about the waste to manage it properly.

B.1.2 Scope

This WAP applies to DST system dangerous wastes and activities regulated by WAC 173-303. The range of activities addressed by this WAP includes waste storage, waste treatment (limited to corrosion control), waste transfers and waste intrusive activities. Section B 2.0 below contains detail on these activities.

B.2 UNIT DESCRIPTION

The DST TSD unit is located on the Hanford Site. Storage and waste transfer are principal functions of the DST TSD unit. However, chemical treatment may also occur as necessary to prevent internal DST corrosion. For clarifying discussions within the DST WAP, the "DST System" means a dangerous waste storage or treatment tank (or tanks) and its associated ancillary equipment and containment system.

B.2.1 Description of The Double-Shell Tank Treatment, Storage, and Disposal Unit Process and Activities

The principle functions and their relation to this WAP are summarized below.

B.2.1.1 Waste Storage

The DST TSD unit currently stores waste from:

- SSTs
- 222-S Laboratory
- Dilute miscellaneous waste generated at the Hanford Facility (100, 200 300, 400 Areas and the 240 Complex)
- Supernate and transuranic sludges that consist of neutralized cladding removal
- Waste generated during the Plutonium-Uranium Extraction Plant headend operations, and waste generated during Plutonium Finishing Plant processing
- Concentrated DST waste (slurry) from the 242-A Evaporator
- Mixed waste from 242-A Evaporator floor drains and pump room sump
- Neutralized current acid waste from the first extraction column at the Plutonium-Uranium Extraction Plant
- Liquid waste from the SST System
- Waste from the Grout Treatment Facility
- T Plant Complex decontamination activities

- Waste from the 204-AR Waste Unloading Station

Because of facility, isolation and closure activities some of the wastes described above are no longer accepted into the DST TSD Unit (Section B.2.1.2). These wastes will be stored until other TSD units such as the 242-A Evaporator and Waste Treatment Plant can treat it. Final disposal of these wastes is planned to occur outside of the DST System. For this reason, no treatment to meet land disposal restriction (LDR) requirements is provided in the DST System.

Future waste stored in the DST TSD Unit must meet the requirements of this WAP.

The wastes in the DST Systems are separated according to operational concerns. These concerns primarily pertain to being able to send waste to the 242-A Evaporator for volume reduction and for ensuring that the DST waste will meet the waste acceptance criteria of the proposed treatment facility—the Waste Treatment Plant. Current waste stream separation is based upon organic content, level of radioactivity, and ability to be treated in downstream TSD units (e.g., Waste Treatment Plant). It has not been feasible to implement a separation strategy based on waste numbers because of the varying combinations of waste numbers given to incoming waste, limited storage capacity, and DST TSD unit design. Because of this, all wastes currently in the DST System have been assigned the same dangerous waste numbers (Part A Form , Addendum A). Waste stored in the DSTs requires periodic monitoring and compatibility assessments to determine whether waste characteristics have changed (see Sections B.2.1.3, B.2.2.2.1, and B.3.4).

B.2.1.2 Waste Transfer

This WAP addresses seven types of waste transfers divided into two categories; internal and external. Internal transfers generally require a waste compatibility assessment but do not require generation of a waste stream profile. External transfers into the DST System require both a waste compatibility assessment and a waste stream profile (see Section B.2.1.1) with the exception of waste from 242-A Evaporator floor drains and pump room sump.

B.2.1.2.1 Internal Transfers

Internal transfers occur within the DST TSD unit boundary as defined by the DST Part A Form (Addendum A) and the DST topographic maps. Table B.2.3 provides documentation requirements for internal transfers. The following internal transfers are allowed within the DST System TSD Unit:

- DST–to–DST within a double-shell (DST) farm (intra-farm transfers)
- Cross-site transfers; DST tank farm to DST tank farm between 200 East to 200 West or vice versa
- DST Farm–to–DST farm within the same Area (intra-area; this would only apply to the 200 East Area)
- Truck transfers directly through DST risers or through temporary waste transfer lines. Three subcategories of transfers include:
    - Bulk chemical product (non-waste) transfers, for the purpose of waste treatment (Section B.2.1.3)
    - Waste from non-connected[1] secondary containment (pits, vaults, and sumps; Table B.6.2 item #4)
    - Waste from non-connected catch tanks and isolated miscellaneous underground storage tanks as listed in the Monthly Waste Tank Summary Report. (IMUSTS Table B.6.2 item #4)

[1] "non-connected" means that the component is not physically connected to the DST System, or the existing transfer route is not RCRA compliant

B.2.1.2.2 External Transfers

Waste transferred across TSD unit boundaries is referred to for the purposes of this WAP as an external transfer. Table B.2.2 provides documentation requirements for external transfers. The following external transfers are allowed at the DST System TSD unit:

- 222–S Laboratory to DSTs
- 242 A Evaporator to or from a DST
- SST–to–DST
- DST supernate to SST

Note that an external transfer from the DST System to the 242-A Evaporator is required to meet the waste acceptance criteria of the 242-A Evaporator (see Section B.7.2.1 in Permit in the 242-A Evaporator Unit Permit (Operating Unit 4)). However, waste from radiological decontamination activities or waste in the secondary containment at the 242-A Evaporator that is transferred to the DST TSD through floor drains and the pump room sump are not tested prior to transfer. This is in part due to the design of the two units, and that this waste stream is generated from previously characterized DST waste accepted into the 242-A Evaporator.

DST waste supernate transferred to the SSTs (for retrieval purposes only) must meet waste acceptance criteria established in SST tank waste remediation work plans or process control plans.

Table B.3.1 of this WAP lists the required waste analysis parameters based upon the type of waste transfer (see B.1.2.2) performed. The content and level of waste in each tank are tracked and reported in summary reports. The amount of waste received by the DSTs is reported annually to the Washington State Department of Ecology (Ecology) in the Hanford Facility Annual Dangerous Waste and Land Disposal Restrictions Reports.

B.2.1.3 Waste Treatment

Limited waste treatment as necessary for corrosion control occurs within individual DSTs (Addendum A). Waste chemistry limits to mitigate internal corrosion exist for the hydroxide ion (OH^-), nitrite ion (NO_2^-), and nitrate ion (NO_3^-) The in-tank concentrations of these ions change over time, and therefore must be controlled by 1) limiting the concentration of these ions for waste transfers into and within the DST System and 2) by adding bulk chemicals (Section B.2.1.2.1). Waste analysis parameters (see table B.3.1) include evaluation of (OH^-), (NO_2^-), (NO_3^-) and pH prior to waste acceptance into and within the DST system. In addition to WAP requirements, further control of these ions comes through the implementation of Permittees waste compatibility and chemistry control programs.

Some treatment may be required to meet the waste acceptance criteria of a receiving unit, such as the 242-A Evaporator (see Section B.2.1.2.2) or as part of SST closure activities (aggregation of solids). However, no intentional treatment is performed to remove a dangerous waste number or to meet LDR requirements. Permissible dilution of waste constituents occurs during aggregation of different waste streams to allow for centralized treatment of the waste (55FR22520, 22666, “Land Disposal Restrictions for Third-Third Scheduled Wastes”). Section B.7.2 further discusses LDR requirements.

B.2.1.4 Waste Intrusive Activities

Activities such as installation and operation of sampling equipment, monitoring equipment, and mixer pumps, may also cause changes to waste composition. Waste intrusive activities typically support the primary operational activities allowed by this permit (e.g., treatment, storage and/or transfer of waste). Potential waste compatibility issues resulting from waste intrusive activities are assessed in conjunction with the operational activities allowed under this permit.

B.2.1.5 DST Generator Activities

The DST TSD unit also generates solid waste (newly generated waste) during sampling, maintenance, and operational activities. Typically, this newly generated waste has contained or contacted the mixed wastes stored in the tanks. This waste is handled as newly generated waste in accordance with the requirements in WAC 173-303-170 and -200 and is not covered by this WAP. On occasion, tank-intrusive equipment may be abandoned in place within a tank to keep radiation exposure levels to the workers as low as reasonably achievable (ALARA) as required by 10 CFR 830, "Nuclear Safety Management." Equipment abandoned in place will be addressed with the closure of the DST TSD unit (Addendum H).

B.2.1.6 Commercial Product and Chemical Compatibility

Chemical compatibility to the DST waste are performed on all chemical products used in the DST system for an addition to the DST up to a quantity of 200 gallons per use. The compatibility determination of these chemical products must be maintained in the operating record.

B.2.2 Waste Acceptance Criteria for Waste Transfers into and within the Double-Shell Tank Treatment, Storage, and Disposal Unit

All waste transfers into and within the DST System must meet the waste acceptance criteria set forth in this document. The waste acceptance approval process requires an evaluation of the waste stream based on information contained in the Waste Stream Profile (WSP) (See Section B.2.2.1.1) for external transfers. Table B.2.1 summarizes the steps of the approval process. Note that transfers within the DST System (See Section B.2.1.2.1) do not require submittal of a WSP, but generally require a waste compatibility assessment.

Table B.2.1 Summary of Waste Stream Approval Process.

Step	Action
1	Waste shipper submits a completed WSP (for external transfers only) and waste characterization data to the Permittees.
2	The Permittees evaluates the waste for conformance to safety, regulatory, and operational considerations, and notifies the waste shipper of the decision. If the waste acceptance is conditional, the stated additional requirements will be met before final waste acceptance and waste transfer (for both internal and external transfers).
3	The waste shipper submits required additional information.
4	The Permittees conducts a compatibility assessment based on the information submitted by the waste shipper for external and internal transfers except for those exempted in Table B.6.2.
5	The Permittees determines the acceptability of waste for transfer and notifies the waste shipper of the decision about accepting the waste (for both internal and external transfers).
6	The waste shipper receives notification of waste acceptability and meets any waste acceptance conditions. This is documented by issuance of a compatibility assessment (for both internal and external transfers).
7	The waste shipper schedules the waste transfer with the Permittees (for both internal and external transfers).

WSP: Waste Stream Profile

Approval for waste transfer is given after completion and approval of transfer-specific information and documentation (Tables B.2.2 and B.2.3). Requirements for each transfer include but are not limited to (1) analytical results, (2) treatment of waste to meet DST System corrosion specifications, (3) certification that waste conforms to the information contained within the approved WSP (external transfer only), and

(4) confirmation (see Section B.6.0) that the waste shipment matches the information in the WSP (external transfer only),(5) for internal transfers, confirmation that the waste shipment meets waste acceptance criteria (see Section B.6.0). The Permittees may require the submittal of additional information to address regulatory and operational concerns. The WSP provides a method for ensuring that receipt of the waste will not conflict with regulatory and safety issues.

Table B.2.2 Information Required Before External Waste Transfers into the Double-Shell Tank Treatment, Storage, and Disposal Unit are allowed.

	Information Requirement	Regulatory Requirement	Rationale
1.	Waste stream profile. The waste shipper completes the WSP and provides waste characterization data, relevant historical data, and background information on waste contents. Note that a waste profile is not required for internal transfers	WAC 173-303-300(2) WAC 173-303-380 (1)(a) and (2)	Information required to determine suitability of waste to storage in a DST System. Information will be used to evaluate the waste for safety, regulatory, and operational considerations.
2.	Waste compatibility; Permittees performs a waste compatibility assessment.	WAC 173-303-395	Helps prevent compatibility problems associated with mixing wastes that could react with each other.
3.	Confirmation of waste composition. The Permittees requires sampling and analysis at the waste shipper location to confirm that the waste composition matches the information contained on the WSP (section B.6.0).	WAC 173-303-300(1)	Ensures the WSP accurately represents the waste being shipped. Owner /operator must confirm his knowledge of waste prior to storage, treatment or disposal

Table B.2.3 Information Required Before Internal Waste Transfers Within the Double-Shell Tank System are allowed.

Information Requirement	Regulatory Requirement	Rationale
Waste compatibility assessment by DST contractor.	WAC 173-303-395, WAC 173-303-640(5), WAC 173-303-640(2)	Helps prevent compatibility problems associated with mixing wastes that could react with each other and helps ensure that the waste receipt will not result in any adverse consequences.
Appropriate waste transfer documentation in waste manifests or transfer data sheets that include information such as: Tanks involved with the transfer Date(s) of transfer Signature authorization for transfer Expected volume of transfer including flush volumes	WAC 173-303-380(1) and (2)	Verifies the identity of the waste as a last check before actual receipt of waste. No manifests are involved in DST transfers because all waste sent to the DST TSD Unit comes from another Hanford unit. However, a WSP is required for external transfers, and compatibility assessment is required for all waste transfers.
Confirmation of waste composition. Any confirmation specified in Section B.6.1of this document or that was specified in the approval of the waste stream.	WAC 173-303-300	Owner /operator must confirm his knowledge of waste prior to storage, treatment or disposal

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.
DST: double-shell tank.
LDR: land disposal restrictions.
WSP: waste stream profile.

B.2.2.1 Waste Stream Profile

A WSP is prepared as part of a preapproval process for an external waste transfer into the DST System. The Permittees uses the information in the WSP and waste characterization data to evaluate safety, programmatic and operational acceptability and to document information needed to meet waste acceptance criteria per this WAP. A WSP is required for each external transfer (see Section B.1.2.2) into the DST System.

The WSPs are completed by performing a detailed chemical and physical analysis (as defined by WAC 173-303-300 (2)) on a representative waste sample and by applying existing knowledge to the same or similar waste. The latter type of information is referred to as process knowledge or "knowledge" as defined in WAC 173-303-040 and WAC-173-303-300(2)(a) must be documented in WSP.

B.2.2.1.1 Elements Waste Stream Profiles

Supporting information used to generate a Waste Stream Profile (WSP) must be documented. Acceptable documentation includes sampling and analysis for individual parameters subject to sampling and analysis requirements and written process descriptions that detail chemical input and output.

One WSP must be completed for each discreet type of waste. A discreet type of waste is defined as a waste stream originating from the same source and/or process that has the same or very similar composition.

WSPs must include at a minimum the following information:

1. **Waste Shipper Information**
   - Name of the organization that is in charge of transferring the waste
   - Name of a person who is knowledgeable about the waste and to whom questions can be directed. Also, provide this person's phone number and MSIN.
2. **General Waste Information**
   - Name of the Waste shipper.
   - Name given to the waste stream. Each waste stream must have a discreet name.
   - Describe the process that generated the waste.
   - Provide anticipated volume of each waste transfer. This volume should include any flush water that will be transferred with the waste and should represent the total volume received. This is not a commitment to send this volume of waste but is used for waste volume projections.
   - Provide the anticipated transfer frequency.
   - Provide the method of waste transfer (railcar, truck, and pipeline).
   - Indicate whether actual laboratory analytical data were used to fill out the profile sheet. If analytical data were used, then provide a reference for the document used as the basis for the testing such as a waste analysis plan and/or sampling analysis plan. If no document exists, list "Not Applicable". Cite the referenced document containing the latest analytical results or attach a copy of the latest analytical results.
   - Indicate whether or not the waste stream contains any waste that was not generated as part of cleanup of Hanford.
   - Indicate whether or not the waste stream is subject to the Toxic Substance Control Act (40 CFR Part 761).
   - Indicate if the waste is subject to any disposal requirements other than those of the Resource Conservation and Recovery Act (40 CFR Part 260 -268) and Washington States Dangerous Waste regulations (Washington Administrative Code 173-303). If other requirements are applicable indicate what the requirements are in an attachment.
   - Indicate whether or not the waste or any portion of it contained 10% or more organics at the point of origination (generation). This is used for determining the applicability of 40 CFR Subpart BB. Refer to the regulation if there is a question on applicability of this requirement.
   - Indicate whether or not the waste meets the exemption criteria for mixed waste that is listed in Subpart CC of 40 CFR 265.1080(b)(6).
   - Indicate if the waste contain any material that was generated by a spill.
3. **Overall Waste Stream Composition**
   - List all constituents of the waste that are equal to or greater than 1,000 mg/kg.
   - Provide the maximum and minimum concentration values for each constituent. Units must be included for each value. For dangerous wastes, include the concentration of each constituent listed in WAC 173-303-9904 for all applicable waste numbers. For example if the waste has been designated as F005 because of toluene and benzene, then the concentrations of these two constituents need to be reported.

- Provide the expected average concentration of each reported constituent. The sum of the numbers must equal 100%.
- For each component, indicate whether the information furnished is based on process knowledge, analytical information, or a combination of the two.

4. **Physical Properties**

- Indicate the physical state (liquid, solid, semisolid, slurry, sludge, or gas) of the waste as it will be received by the DST system
- Describes the viscosity of the waste
- Indicate whether there are multiple layers in the waste and give the approximate percent by volume of each layer
- Describes the amount of suspended solids in the waste by volume. If there are no suspended solids then indicate accordingly
- Provide the flash point
- Indicate the expected color of the waste
- Indicate whether or not the waste contains PCBs and if so give the maximum and minimum concentrations of PCBs that will be found in the waste
- Indicate whether or not the waste contains organics and if so give the maximum and minimum concentrations of organics that will be found in the waste.

5. **Specific Analysis**

- Indicate the minimum, maximum, and average concentration for each parameter (Table B.3.1). Also indicate whether process knowledge or analytical information is being used as the basis for the information. A value for each parameter must be given. It is permissible to enter concentrations as less than or greater than values. A unit must be specified for each value.

Note: Analytical results for the parameters in this section must have been obtained after May 1989.

6. **Reactivity and Stability**

- Provide the reactivity group number(s) for the waste. The numbers and procedure for their determination are contained in EPA's document No. EPA 600/2 84 057 and titled Design and Development of Hazardous Waste Reactivity Testing Protocol. Alternatively the group numbers listed in 40 CFR 265 appendix V may be used.
- Indicate whether the waste is stable. If it is unstable (can detonate, deteriorate, or otherwise spontaneously change) indicate what may happen.
- Indicate whether the waste is shock sensitive. If it is shock sensitive, state the reason for this property and indicate what may happen if the waste is exposed to shock.

7. **Dangerous Waste Information**

- Indicate whether the waste is a dangerous waste as defined by WAC 173-303.
- If the waste is a dangerous waste, indicate the waste numbers assigned to the waste and the reason for the application of the waste number. Waste transfer documentation will indicate waste numbers applicable for each transfer. If the waste is not a dangerous waste indicate accordingly.
- Indicate whether the waste is a mixed waste.
- If any transfer of the waste will contain a reportable quantity of a chemical listed in 40 CFR 302.4, identify the chemical and its reportable quantity. If no waste transfer will contain a reportable quantity, then indicate that as well.

8. **Land Disposal Restriction Information**

- This section is used to document all Land Disposal Restrictions (LDR) including any underlying hazardous constituents.
- Provide all waste numbers for components that do not meet LDR requirements. Each waste number must be placed on a separate line. If the waste is not subject to any LDR requirements, then indicate accordingly.
- Waste constituents for which Permittees must monitor: Enter the name of the regulated constituent which does not meet LDR standards and for which further treatment is required. Enter this information next to appropriate waste code. (See 40 CFR 268.7 (a)).
- Indicate wastewater or nonwastewater (third column): State if the LDR requirement is for a wastewater or nonwastewater. Treatment standard (fourth column): Identify the LDR limit that must be met. This will be either a concentration or a specified technology.

9. **Supplemental Information and Accountability Statement**

Attached items providing additional information must be identified by title in the WSP. Is there an attachment(s) containing additional information?

_____Yes _____No (list below)

A certification with the below statement must be signed and signatures must be submitted with the WSP.

I hereby certify that to the best of my knowledge all information submitted in this and all attached documents contain true and accurate descriptions of this waste. Any sample that was analyzed or submitted was representative as defined in 40 CFR 261 Appendix I or by using an equivalent method. All relevant information regarding known or suspected hazards in the possession of the Waste shipper has been disclosed.

_____	_____
Authorized signature	Authorized signature
_____	_____
Name and title (print)	Name and title (print)
_____	_____
Date	Date

The signature on the WSP is also used to attest that the Waste shipper has a waste minimization program in effect and that the waste has been subjected to the requirements of that program.

A knowledgeable person must review and certify the waste profile. The signature will be that of an Environmental Compliance Officer (ECO) or other person who normally signs submittals to agencies and who understands 40 CFR and WAC 173-303 requirements as long as that person has knowledge of the waste characteristics. In the event that the ECO does not have direct knowledge of the waste's characteristics, but is relying on information from another party, then both that party and the ECO will sign the WSPs.

The waste shipper has the responsibility of ensuring that information used to complete the WSP represents the waste to be shipped; that sampling and analyses are conducted according to the Sampling and Analysis Plan (SAP), which is submitted as part of the approval process; and that only representative samples are taken.

B.2.2.1.2 Waste Stream Profile Management

The WSP will be managed as follows:

1. Will expire upon completion of transfers as described in the WSP.
2. Must be renewed when the owner or operator has been notified, or has reason to believe, that the process or operation generating the dangerous waste, or nondangerous waste has significantly changed;
3. Must be reviewed for renewal annually for all other WSPs

Approval is granted by the Permittees by issuing a compatibility assessment, which recommends and/or approves the waste transfer. The date on which the compatibility assessment is issued determines the approval date.

B.2.2.1.3 Waste Compatibility

Before transferring any waste stream from the waste shipper to the DST System, the waste is evaluated for potential compatibility problems by the Permittees. The information and limits, which are necessary to ensure safe handling of waste, are documented in this WAP and compatibility assessments that are specific for each transfer. The compatibility assessment evaluates the WSP, waste characterization data, and/or tank composition against the criteria in waste compatibility DQOs. If the analysis shows that the criteria are not met, the transfer will not be authorized. Criteria for other programs and issues also may be considered during the acceptance evaluation.

Transfers within the DST System are handled in a similar manner in that a compatibility assessment is conducted before each transfer. However, WSPs are not required for internal transfers identified in B.2.1.2.1. The compatibility assessments help ensure that no problems will result from a waste transfer.

B.2.2.1.4 Confirmation of Waste Composition

Some sampling and analysis is required to ensure that information in the WSPs accurately represents the actual waste composition. The extent of this confirmation will depend on the particular waste stream but must meet the specification contained in Section B.6.0 of this document. Sampling and analysis results will be included as part of each particular waste stream approval. However, additional sampling and analysis can be required at any time by the Permittees.

B.2.2.1.5 Waste Transfer Documentation

The waste shipper must supply documentation with each internal waste transfer. This information is documented in waste transfer data sheets that are used to track waste transfers into and within the DST System. The waste transfer data documentation must include the following information at a minimum:

- Waste description
- Identification of the waste generator
- Date(s) of transfer
- Authorizing signature for transfer
- Volume of transfer including flush volumes
- Applicable dangerous waste numbers and LDRs.

B.2.2.2 Waste Inventory Management Within the Double-Shell Tank System

The estimated composition of waste in each DST will change over time. The most likely cause of a change in waste composition is due to transfers or other waste intrusive activities but reactions that occur in static tanks can also result in changes in waste composition. Changes in waste composition as described above are discussed in the following subsections.

B.2.2.2.1 Waste Storage

Changes in stored waste composition are caused by many factors including corrosion, chemical reactions, radiolysis, evaporation, and salt formation. To maintain safe and compliant storage these potential changes are assessed periodically through compatibility assessments. The criteria for the periodic compatibility assessment of stored waste are established with this WAP and other documents such as DQOs. Sampling and analysis plans are used to obtain the characterization data to help determine whether a change in composition has occurred. Both new data generated by performing the SAP and existing data are used in compatibility assessment process.

The best available existing waste composition data used for performing compatibility assessments comes from Tank Waste Information Network System (TWINS). TWINS is updated periodically to reflect waste transfers and any new information that becomes available.

B.2.2.2.2 Waste Transfers

Tables B.2.1, B.2.2 and B.2.3 of this document including compatibility assessments are used to evaluate all potential waste transfers except those transfers out of the DST system (see Section B.1.2.2). Results of the evaluation used to meet waste acceptance criteria are documented and retained in the DST operating record. Compatibility assessments may consider requirements such as criticality, which is outside the scope of this WAP. Results of non-WAP evaluations will not be kept in the DST System operating record. If the assessment deems that sampling and analysis are also necessary, analytical results must be obtained and evaluated by the Permittees before the transfer. The inventory information collected in the compatibility assessment will be used to update the TWINS database.

B.2.2.2.3 Waste Intrusive Activities

Management of tank waste may include waste-intrusive activities such as installation of sampling equipment, monitoring equipment, mixer pumps, and retrieval of wastes. Because of these waste-intrusive activities, changes in waste composition and behavior may be induced (e.g., flammable gas releases, toxic gas releases) (see section B.3.4).

B.2.2.2.4 Hazards Management

Chemicals that are produced from changes in waste composition (section B.2.1.2.1) vary greatly and may include hydrogen, ammonia, hydrogen cyanide, volatile organics, and many other compounds. Some of these compounds are toxic and/or flammable and can create a hazard if they are present in sufficient quantity.

In static tanks, the reactions tend to slow down and the composition will stabilize until some activity (such as mixing or transfers) disturbs the waste and alters the equilibrium that has resulted over time. The static reactions also may result in the sudden release of gas. These releases can be from the slow accumulation of gas that builds up sufficiently to overcome the binding properties of the waste or a waste-intrusive activity (such as mixing) that enables the gas to be released.

Besides issues associated with the release of gases, vapors, or fumes, the chemical agents within the waste itself may present a hazard. These hazards may include chemical exposure to chemicals such as mercury and beryllium.

The hazards associated with tank waste are evaluated during the work planning process. The planning process and other work controls require that adequate controls be implemented to ensure that workers are protected and the hazards are minimized. Controls that may be required range from monitoring for flammable and toxic gases, to minimizing potential contact with waste products, to requiring the use of personal protective equipment.

Potential hazards due to waste incompatibilities subject to WAC 173-303-395 are addressed in accordance with Table B.3.1, Section B.3.4 and Addendum F of this document.

Dangerous waste managed in the DST System falls into two categories. Waste that has been accepted in the past, but is no longer accepted into the DST System and waste that is being accepted for storage into the DST System. Section B.2.1.1 lists waste in storage. Section B.2.1.2 describes waste acceptable for transfer.

All waste in the DST System has currently been assigned the same hazardous waste numbers (see Section B.3.1.1). Waste accepted for transfer into the DST System, must have the same waste numbers as listed in the Part A (Addendum A). Because there is no specific treatment in the DST System to remove, immobilize, or destroy characteristic or toxic constituents, waste leaving the DST System must be treated at another TSD unit to meet the LDR requirements identified at the time the waste was generated.

B.2.3 Acceptable Data Requirements

Data used to meet the requirements of this WAP is based on analysis or knowledge as defined in WAC 173-303. In accordance with WAC 173-303-300, the analysis must include or consist of either existing published or documented data on the dangerous waste, or on analytical data from waste generated from similar processes, or data obtained by testing, or a combination of these.

WAC 173-303-040, defines knowledge as; "sufficient information about a waste to reliably substitute for direct testing of the waste. To be sufficient and reliable, the knowledge used must provide information necessary to manage the waste in accordance with the requirements of this Chapter."

Note: "Knowledge" may be used by itself or in combination with testing to designate a waste pursuant to WAC 173-303-070(3)(c), or to obtain a detailed chemical, physical, and/or biological analysis of a waste as required in WAC 173-303-300(2).

WAC 173-303-300(2)(a) requires the following steps to ensure that acceptable knowledge is obtained:

When a dangerous waste management facility uses information or knowledge from the generator to complete a waste profile for a waste instead of direct analysis of a sample, that information must meet the definition of knowledge as defined in WAC 173-303-040. To confirm the reliability of the information or knowledge, the facility must do one or more of the following, as applicable:

- Be familiar with the generator's processes by conducting site visits and reviewing sampling data and other information provided by the generator to ensure they are adequate for safe management of the waste;
- Ensure waste analysis contained in documented studies on the generator's waste is based on representative and appropriate sampling and test methods;
- Compare the generator's waste generating process to documented studies of similar waste generating processes to ensure the waste profile is accurate and current.

One or more of the following types of information could be considered acceptable knowledge:

- Mass balance from a controlled process that has a specified output for a specified input
- Material safety data sheet on chemical products
- Test data from a surrogate sample
- Analytical data on the waste or a waste from a similar process.

In addition, acceptable knowledge requirements can be met using a combination of analytical data or screening results and one or more of the following:

- Interview information
- Logbooks
- Procurement records
- Qualified analytical data

- Radiation work package
- Procedures and/or methods
- Process flow charts
- Inventory sheets
- Vendor information
- Mass balance from an uncontrolled process (e.g., spill cleanup)
- Mass balance from a process with variable inputs and outputs (e.g., washing/cleaning methods).

When process knowledge indicates that constituents, which if present in the waste might cause the waste to be regulated, are input to a process, but not expected to be in the waste, sampling and analysis must be performed to ensure the constituents do not appear in the waste above applicable regulatory levels. This requirement can be met through chemical screening. This sampling and analysis is required only for initial characterization of the waste stream.

When the available information does not qualify as acceptable knowledge or is not sufficient to characterize a waste for management, the sampling and testing methods outlined in WAC 173-303-110 are used to determine whether a waste designates as ignitable, corrosive, reactive, and/or toxic and whether the waste contains free liquids as applicable.

B.3 WASTE ANALYSIS PARAMETERS

This section provides the selection of analytical parameters based on WAC 173-303-300(2) and -300(5)(a) and the EPA Guidance Manual PB94-963603, OSWER 9938.4-03, "Waste Analysis at Facilities That Generate, Treat, Store, and Dispose of Hazardous Wastes." This WAP primarily addresses waste analysis procedures for external waste transfers. External waste generators transferring waste into the DST System at this time include the 242-A Evaporator, the 222-S Laboratory (219-S Waste Handling Facility), and the SST System.

The SST System waste has been extensively characterized in accordance with the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1998), Milestone M-44-00, and to implement recommendations of Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 93-5, "Waste Tank Characterization Studies."

The TWINS database contains the results of analyses conducted for various tank transfers as well as analyses for other purposes. The TWINS database system contains data from both the SST and DST systems. Tank Characterization Reports (TCRs) are issued on a quarterly basis as needed due to addition and/or removal of tank wastes and as new information is obtained. Validated data packages are to be placed in the operating record." Data stored in TWINS are used as the basis for waste transfers into the DST System.

B.3.1 Criteria for Parameter Selection

Regulatory information is based on knowledge as defined in WAC 173-303-040 and/or analysis of the waste. Waste acceptance criteria for external transfers requires confirmation that incoming waste contain only those waste numbers identified on the DST TSD unit, Part A form (Addendum A). Confirmation also includes analytes identified in Table B.3.1 of this document. Sampling and analysis are required for parameters considered important for the safe handling of the waste. Parameter selection is based upon receipt of waste from sources outside the DST System and waste movement within the DST System. These parameters are listed in Table B.3.1.

Table B.3.1 Waste Analysis Parameters Required for Accepting Any Waste Transfers

Parameter	Media type	Rationale for Selection	Transfer type
Energetics (net exotherm or no net exotherm)	Liquid/Slurry	Ignitable /reactive	
Hydroxide (moles/liter)	Liquid/Slurry	Corrosion prevention	E, I
Moisture (volume % water)	Liquid/Slurry	PCB Management/ RBDA Organic Reaction	E, I
Nitrate (moles/liter)	Liquid/Slurry	Corrosion prevention	E
Nitrite (moles/liter)	Liquid/Slurry	Corrosion prevention	E
Organics, separable (visible or no visible organic layer)	Liquid/Slurry	Ignitable /reactive determination	E
pH (pH units)	Liquid/Slurry	Corrosion prevention	E, I, I(1)
PCBs (grams/liter)	Liquid/Slurry	PCB Management/ RBDA	E
Solids (volume %)	Liquid/Slurry	Line plugging	E
Specific gravity	Liquid/Slurry	Line plugging	E, I, I(1)
Total organic carbon (grams/liter)	Liquid/Slurry	Ignitable /reactive/Flammability	E, I
Electrical Conductivity	Liquid/Slurry		E, I, I(1)

E =external
I= internal
I(1) =primarily rain water. Only one sample is required to be submitted to a laboratory for analysis that is tested field tested first.

B.3.1.1 Waste Identification

The first steps in evaluating the acceptability of a waste are to obtain a general description of the waste and to identify the waste numbers and regulatory requirements that apply to the waste. The WSP (see section B.2.2.1) provides the format for documenting and reporting this information. These requirements include ensuring the acceptance of wastes that meet DST System permit requirements and reporting the information required by WAC 173-303-380. The applicability of LDR requirements is collected as well. Waste numbers acceptable at the DST System for storage in tanks are listed on the Part A form (Addendum A) and in Table B.3.2. Sampling strategies for waste identification are covered in Section B.4.1. A difference in dangerous waste numbers between the WSP and the DST Part A will prohibit acceptance of a waste stream into the DST system.

Table B.3.2 Dangerous Waste Numbers Managed at the Double-Shell Tank System. (2 sheets)

Waste Number	Name	Waste Number	Name
D001	Ignitability	WT01	State-only toxicity, extremely hazardous waste
D002	Corosivity	WT02	State-only toxicity, dangerous waste
D003	Reactivity	WP01	State-only persistence, extremely hazardous waste
D004	Arsenic	WP02	State-only persistence, dangerous waste
D005	Barium	F001	Trichloroethylene
D006	Cadmium	F002	Methylene Chloride
D007	Chromium	F003	Methyl Isobutyl Ketone
D008	Lead	F004	Cresylic Acid
D009	Mercury	F005	Methyl ethyl Ketone
D010	Selenium	F039	Multi-source leachate based upon F001-F005
D011	Silver	—	—
D018	Benzene	—	—
D019	Carbon tetrachloride	—	—
D022	Chloroform	—	—
D028	1,2-Dichloroethane	—	—
D029	1,1-Dichloroethylene	—	—
D030	2,4-Dinitrotoluene	—	—
D033	Hexachlorobutadiene	—	—
D034	Hexachloroethane	—	—
D035	Methyl ethyl ketone	—	—
D036	Nitrobenzene	—	—
D038	Pyridine	—	—
D039	Tetrachloroethylene	—	—
D040	Trichloroethylene	—	—
D041	2,4,5-Trichlorophenol	—	—
D043	Vinyl chloride	—	—

B.3.1.2 Identification of Incompatible Wastes

Operating the DST System requires that incompatible wastes are managed pursuant to WAC 173-303-395(1). For the purposes of this document, wastes are considered compatible if, when mixed, they do not:

(1) generate extreme heat or pressure, fire or explosion, or violent reaction;

(2) produce uncontrolled toxic mists, dusts, or gases in sufficient quantities to threaten human health;

(3) produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions;

(4) damage the structural integrity of the device or facility containing the waste; or

(5) through other like means threaten human health or the environment [WAC 173-303-395(1)(b)].

Waste is unsuitable for placement in a particular device or facility if it may corrode or decay the containment materials or is unsuitable for mixing with another waste because the mixture might produce heat or pressure, fire or explosion, violent reaction, toxic dusts, fumes, mists, or gases, or flammable fumes or gases [WAC 173-303-040]. Parameters for identifying primary waste incompatibilities are identified in Table B.3.1. Control strategies for these waste incompatibilities are addressed in Section B.3.4, Addendum F, other compatibility assessment documents, and the work planning process as appropriate.

B.3.2 Parameter Selection Process

The requirements for safe handling, transfer, and storage of wastes managed in the DST System are determined through the application of the DQO process in accordance with condition II.D.3 and by the waste acceptance criteria (see Section B.2.2).

The information requirements used to determine waste acceptance for external waste transfers into the DST System and internal transfers within the DST System are summarized in Table B.2.2 and Table B.2.3.

Data needs and sampling and analysis requirements to support WSPs change over time and are triggered by many factors, including (1) data requirements that become better defined through changes in DQOs and other documents, (2) new information that becomes available , (3) changes that occur in regulatory requirements, and (4) waste confirmation results that show waste composition discrepancies.

The timing to implement changes will depend on the specific change but will be no later than the annual renewal of the WSP (see Section B.2.2.1.1). If a change is significant to the proper handling or storage of a waste, implementation of the change will be made before the next shipment of the waste.

B.3.3 Rationale for Parameter Selection

The requirements for waste analysis are identified in WAC 173-303-300. The requirements include (1) obtaining a detailed chemical analysis of the waste, (2) identification of how the information is kept current, and (3) confirmation of the identity of any waste received from offsite.

The chemical analysis must be sufficient to enable safe management of waste in a manner that will meet the regulatory requirements of WAC 173-303. Because there are no LDR requirements associated with DST System operations (other than if spills or releases occur), the main rationale for parameter selection is to maintain waste compatibility.

The identification of analysis that is required to handle the waste in a safe and compliant manner is provided in Tables B.3.1 and B.5.1. Issues addressed for transfer approvals include corrosion, flammable gas generation, energetics, and reactivity.

B.3.4 Special Parameter Selection

Wastes accepted in the DST System have been designated among other things (see Table B.3.2) as ignitable and reactive wastes. Because of the properties of the waste, small quantities of a wide variety of gases are continuously being produced. The sampling strategy for reactive and ignitable waste are addressed in Section B.3.4.1. Because it is not possible to prevent the formation of gas in the tank waste, various process controls are relied on to prevent the accumulation and ignition of flammable gases.

Process controls that may be utilized include (1) controls to ensure that flammable gas concentrations remain ≤25% of the LFL (e.g., active ventilation of tank headspace), (2) periodic monitoring to verify that the flammable gas concentration in the tank headspace is ≤25% of the LFL (and stopping the operation if ≤25% of the LFL is exceeded), and (3) application of ignition source controls. The Industrial Safety Management Program is also relied on to ensure appropriate flammable gas entry monitoring requirements are established to protect facility workers during manned work activities involving locations or equipment where flammable gas hazards may exist. This WAP and other compatibility assessment documents are used to evaluate all waste transfers so that these characteristics do not pose a problem.

B.3.4.1 Gas Monitoring Requirements

Flammable gas monitoring is used as part of the flammable gas hazard management control strategy in an effort to reduce the risk of radiological and toxicological material being released because of flammable gas accidents.

Gas release (spontaneous and induced) hazard controls for DSTs are applied according to the tank waste group designations A, B, and C (see Table B.3.3). Ignition controls are to be applied at all times in the tank headspace and in connected enclosed spaces directly above any tank farm facility that can spontaneously release sufficient gas to achieve a flammable gas concentration of ≥ 100% of the LFL. A flammable gas concentration control point of ≤25% of the LFL shall be implemented for all tank farm facilities during activities that can induce a gas release, which can achieve 100% of the LFL without the use of flammable gas concentration controls (e.g., active or manually configured passive ventilation, process controls, flammable gas concentration monitoring and proceduralized actions). Any combination of flammable gas concentration controls may be used to maintain flammable gas concentration <25% of the LFL.

A flammable gas concentration control point of ≤25% of the LFL also shall be implemented for non-DST/SST tank farm facilities (e.g., double-contained receiver tanks [DCRT], DST annuli, active catch tanks, Inactive Miscellaneous Underground Storage Tank [IMUST], waste transfer associated structures), which can achieve 100% of the LFL in a steady-state condition without the use of flammable gas concentration controls (e.g., active or manually configured passive ventilation, process controls, flammable gas concentration monitoring, and proceduralized actions) or ignition controls shall be applied at all times in the tank farm facility headspace and connected enclosed spaces.

If flammable gas concentration controls are selected, any combination of flammable gas concentration controls may be used to maintain flammable gas concentrations <25% of the LFL. Flammable gas concentration controls shall be monitored on a sufficient frequency to ensure that appropriate actions are taken for conditions >25% of the LFL.

If the concentration of flammable gas is >25% of the LFL:

1. IMMEDIATELY stop all activities in and directly above the affected tank farm facility, except for the following:
   - Flammable gas sampling/monitoring
   - De-energizing, removing, or stopping the use of equipment that does not meet ignition controls
   - Actions to reduce the flammable gas concentration.
2. Prior to the concentration of flammable gas exceeding 60% of the LFL:
   - Stop all activities in enclosed spaces connected to the affected tank farm facility headspace, except for flammable gas sampling/monitoring and actions to reduce the flammable gas concentration
   - De-energize, remove, or stop use of equipment that does not meet ignition controls in the affected tank farm facility headspace and connected enclosed spaces.

Implementation of those controls deemed necessary to manage the flammable gas hazards present at the Tank Farms are controlled in accordance with various Tank Farms Administrative Controls and Safety Management Programs. Note the tank waste group designations can and do change periodically based on existing conditions. For example, a Group B designated tank can be downgraded to a Group C designation by transferring waste from the Group B tank and vice versa. The exception is the Group A tanks. Because of the associated hazards, transfer of waste into Group A tanks or creation of new Group A tanks is prohibited without prior approval from DOE-ORP[2]. Waste transfer out of Group A tanks is allowed which may or may not downgrade the tank to a B or C designation. Table B.3.3 provides current designation of the several DSTs. Updates to this list occur periodically.

Table B.3.3 Waste Group Designations.

Waste Group A[1]	Waste Group B[2]	Waste Group C[3]
DSTs: AN-103, 104, 105 AW-101 SY-103	DSTs: AN-102, AP-105, 108 AW-104, 106 AY- 102 SY-101	DSTs: AN-101, 106, 107 AP-101, 102, 103, 104, 106, 107 AW-102, 103, 105 AY-101 AZ-101, 102 SY-102

[1]Waste Group A: Tanks with a potential spontaneous buoyant displacement gas release event (BDGRE) flammable gas hazard in addition to a potential induced GRE flammable gas hazard. Theses tanks are (a) conservatively estimated to contain sufficient retained gas to achieve 100% of the LFL if all of the retained gas is released into the tank headspace, and (be) determined or predicted to exhibit spontaneous BDGRE behavior. (This is critical difference between waste group A and B tanks.)

[2]Waste Group B: Tanks with a potential inducted GRE flammable gas hazard, but no potential spontaneous BDGRE flammable hazard. These tanks are conservatively estimated to contain sufficient retained gas to achieve 100% of the LFL if all of the retained gas is released into the tank headspace but are only susceptible to induced GREs.

[3]Waste Group C: Tanks with no potential GRE flammable gas hazard that are conservatively estimated to contain insufficient retained gas to achieve 100% of the LFL even if all of the retained gas is released into the tank headspace.

BDGRE = buoyant displacement gas release event.
GRE = gas release event.
LFL = lower flammability limit.

B.3.4.1.1 Entry Monitoring (and Associated Ignition Source Controls)

Flammable gas concentrations in intrusive work locations must be verified to be below the flammable gas work control limits before beginning manned work. This requirement shall be applied to all manned work activities in waste-containing vessels when the manned work activity is near an opening in the vessel containment. Meeting this requirement will ensure that flammable conditions in the workspace are not present because of steady-state accumulation or recent gas release events (GRE).

For manned activities on tanks, the entry monitoring requirements are as follows:

1. Monitor at breather filter or vent duct prior to start of activity.
2. For work in pits, monitor in pit prior to the start of pit work.

3. Monitor inside riser (passive or active ventilation) or allow for a 1-minute pause with riser opened (active ventilation only) prior to start of dome intrusive activities.
4. For dome intrusive work, follow steps 1 and 3 above, plus monitor below bottom of riser (passive or active ventilation) or in vent duct upstream of first mixing point (active ventilation only) prior to start of activity.
5. For manned activities inside of waste intruding equipment, monitor in the vapor space prior to start of activity.
6. For manned activities in non-tank waste transfer system regions, monitor in the vapor space where the activity is to be performed.

Manned work shall not begin or proceed if flammable gas concentrations are >25% of the LFL except for gas sampling and necessary actions to reduce gas concentrations or de-energize ignition sources. Installed qualified equipment (equipment that is qualified in accordance with the appropriate ignition source controls) may continue to operate (not be de-energized) if flammable gas concentrations are >25% of the LFL. Until gas concentrations of <25% of the LFL are verified, the equipment used to perform this confirmation shall meet the requirements of ignition source controls.

B.3.4.1.2 Manned Activities (Continuous Monitoring)

Because of the possibility of flammable conditions developing during work as a result of a GRE, depending on the flammable gas facility group and activity type, workspace (ex-tank-intrusive or dome intrusive) monitoring is continued. This means using a continuous monitor, such as a portable combustible-gas meter (CGM) that monitors continuously and is set to alarm before flammable gas concentration exceeds 25% LFL. Additionally ignition source controls are imposed in these locations to prevent ignition in the unlikely event that flammable conditions develop. The potential for an errant (uncontrolled) spark is judged to be higher during manned work activities even though all equipment must meet ignition source controls for manned activities and unmanned operations. The chance of an errant spark is judged to be higher during manned activities because equipment is being manipulated, and the chance for human error is present. Therefore, a distinction is made between manned and unmanned activities. Manned activities require continuous monitoring and work stoppage if the concentrations exceed 25% of the LFL; unmanned operations generally do not require monitoring. Monitoring thus provides an additional safety measure to the ignition source controls during these activities. Therefore, all manned work activities must immediately halt if flammable gas concentrations exceed 25% of the LFL, with exceptions such as gas sampling and necessary actions to reduce gas concentrations and deenergizing ignition sources.

B.3.4.1.3 Unmanned Operations

The Tank Farm TSR does not require continued monitoring for flammable gases of remotely controlled waste transfer valves, mixer pumps and airlift circulators in actively ventilated tanks. This is because installed equipment must meet ignition source control requirements. Errant spark sources (that might result during manned activities) are minimal. Released gases will be diluted and swept from the tank by the ventilation flow. Adequate protection is provided by requiring installed equipment to meet ignition source controls.

During unmanned global waste disturbing operations in passively ventilated tanks, flammable gas concentrations from GREs may persist for a long time because of low ventilation flows.

If the flammable gas concentration is >25% of the LFL, flammable gas concentrations sampling/monitoring shall be monitored on a sufficient frequency to ensure that appropriate actions (i.e. stopping activities or use of equipment causing increase production of flammable gases) are taken for condition >25% of the LFL.

B.3.4.1.4 Monitoring Following a Loss of Ventilation

Monitoring is used to cause the shutdown of uncontrolled spark sources if flammable gas concentrations of concern develop because of a loss of required ventilation. Ventilation in many tank farm facilities is provided to prevent the accumulation of flammable gas caused by steady-state releases and to dilute released gases before they reach ventilation system equipment that does not meet ignition source control requirements (such as pressure switches and continuous air monitors in DST ventilation systems). If this ventilation is lost, flammable gas concentrations may increase, but in a steady manner. Following a loss of ventilation, periodic monitoring is required to trend the flammable gas concentrations and actions are taken to eliminate the uncontrolled spark sources if levels of concern are reached. Gas sampling when concentrations exceed 25% of the LFL is permitted under limited conditions.

B.3.4.2 Toxic Gas Monitoring

Potential toxic gas releases are addressed in the work planning process on a case by case basis.

B.4 SELECTION OF SAMPLING PROCEDURES

This section contains requirements for the sampling methods and procedures that must be used for all analytical requirements specified by this document. The two types of samples required by this document include samples taken by the waste shipper in support of obtaining and maintaining approval to ship waste to the DST System and samples taken in the DST System support hazard evaluation and environmental compliance issues associated with waste transfers. The requirements WAC 173-303 were used as the basis for determining the sampling requirements of this WAP. The DST sampling is conducted according to requirements contained in this WAP, as implemented by specific sampling and analysis plans (SAPs).

B.4.1 Sampling Strategies

Sampling strategies must ensure a representative sample is obtained. The strategies for obtaining samples are discussed in Sections B.4.1.1 through B.4.1.3.

B.4.1.1 Sampling Strategies Required for Double-Shell Tank Customers

The requirements of this section apply to samples taken for the WSP required analytes and for samples required by Section B.5.0 of this document. The waste shipper will discuss and resolve sampling strategy issues with the Permittees to ensure requirements of this section are met.

Sampling strategies must ensure that a representative sample is obtained and be described in the waste shippers' WAP or equivalent document. The document must state the sampling strategy to be used and substantiate that the strategy will yield representative information. The sampling strategy should maximize data accuracy and minimize errors attributable to incorrectly selected sampling procedures. Specific requirements for the plan include (1) specification of the type and number of samples, (2) the number of samples that must be taken to estimate the variability of the waste's composition, (3) the sampling methods that will be used, and (4) the sample locations that will be used and the rationale for selecting locations. The sampling documents also must ensure that at least two samples are obtained and analyzed for all parameters listed in Table B.3.1of this WAP (see Table B.3.1 for suspected rainwater exemption).

B.4.1.2 Sampling Strategies and Documents for Samples Taken for Double-Shell Tank System

The SAP documents sampling and analysis strategies for each sampling event and/or project. Each SAP is developed to meet the waste acceptance criteria per this WAP's applicable DQOs, assess the sending tank's current waste volume and determine available risers for sampling. In some cases, the requirements of multiple DQOs may be addressed in a single SAP. For the purposes of this WAP, sampling and analysis requirements are to address waste compatibility issues as specified in the data

quality objectives for each specific waste transfer. Each DQO document must contain the following: a sampling design, analytical parameters, minimum quality control (QC) requirements, and required quantification limits or equivalents in accordance with condition II.D.2.

The DQOs are converted into concise direction for field sampling and laboratory analysis in SAPs. Direction for field sampling includes specifying the number and location of samples, the sampling method selected based on the waste media, container types, and sample shipping requirements. Direction for laboratory analysis includes sub sampling and or composite sample formation, sample handling, and preparation, analytical parameters (analytes), and methods. The SAPs also address quality assurance (QA) and QC requirements for sampling and analysis. Field QC requirements such as sample replicate, field blanks, and trip blanks are addressed. Laboratory QC requirements such as standards, matrix spikes, analytical replicates, and blanks are specified. In addition, the performing laboratory is required to implement its QA plan for calibration and maintenance of analytical systems. Sample chain-of-custody requirements are specified. Sample integrity requirements (i.e., holding times, chemical preservation, cooling) are addressed where applicable. Minimum detection limits or equivalents are specified for the analytes. Letters of instruction, process memos, or test plans may be used in place of SAPs when sampling and analysis requirements are simple and/or when data are used for process control or testing. Sampling documents are maintained in the DST operating record.

Additional analytical information also may be obtained by analyses conducted according to other documentation such as a letter of instruction or process memorandum. Specific requirements for the SAPs and other sampling documents include the following;

(1) the type and number of samples

(2) sampling methods that will be used

(3) the sample locations that will be used and the rationale for selecting locations (ie., must be representative),

(4) sampling frequency

(5) sample collection(required sample volumes, appropriate sample containers and equipment) and handling techniques

(6) use of the appropriate field QA/QC

B.4.1.3 Approval of Sampling Strategies

The Permittees will review and evaluate the sampling strategies proposed by waste shippers. The Permittees will evaluate the acceptability of strategies to obtain a representative sample and to satisfy the requirements stated in Section B.3.1.1. The Permittees will make recommendations to the waste shipper to ensure this strategy will meet DST System waste acceptance criteria.

B.4.2 Selection of Sampling Equipment

Shippers of dangerous waste to the DST System are responsible for selecting and using the correct sampling methods and procedures for characterization of the waste according to Permit Condition I.F.1. As stated in Sections B.4.1.1 and B.4.1.3, before accepting a waste shipment (transfer), the shipper must demonstrate to the Permittees that the correct sampling methods were used. That is, the selected methods or procedures are capable of obtaining representative samples.

The Permittees uses a number of methods to collect waste samples from the Hanford tanks. Because of the highly radioactive nature of the waste, the tanks are buried underground and have limited access. In addition, the sampling methods and procedures were developed such that radiation contamination and worker exposure are minimized. Therefore, some sampling methods and procedures are unique to the Hanford Site.

Sampling methods used for tank waste include bottle-on-string, core sampler, finger trap, and clamshell.

Bottle-on-string samplers are similar to the EPA weighted bottles. The bottle-on-string sampling procedure was developed in accordance with ASTM E-300, *Standard Practices for Sampling Industrial Chemicals*. An empty glass bottle, closed with a stopper, is placed in a metal cage and lowered to the desired depth using a cable. The stopper is removed to allow the bottle to be filled with the waste. The bottle is then retrieved from the tank, placed in a radiation-shielded cask, and shipped to the laboratory. This method is limited to sampling of liquids and/or liquids with suspended solids. This method is ideal for obtaining samples at the waste surface to determine if an organic layer is present.

Core samplers are used to obtain solids that are present as a thick layer on the tank bottom. Sub-layers may also exist within the solids as a result of different processes that generated the waste. To characterize the solids, full-depth cores of solids may be taken, depending on the purpose for sampling. If the solids layer is very thick, multiple successive segments of 19 in. are taken to represent the entire layer. After removal from the tank, the segments are placed in shielded casks and shipped to the laboratory. Use of core samplers is limited by the thickness of the solid layer. Thicker layers of solids allow more sample collection in the 19 inch core sampler. Because the core segment samplers are water-tight, they also may be used to collect liquids or slurries.

Finger-trap and clamshell samplers are used to obtain solids that are present as a thin layer on the tank bottom. The clamshell sampler has a pneumatically operated sample body and jaws that are shaped like a clam. It is capable of obtaining solid or slurry waste samples. The finger-trap sampler is a stainless steel pipe that is closed on one end. At the open end, the sampler has thin, flexible, overlapping stainless steel blades that bend inward. To collect a sample, the sampler is dropped vertically into the waste. Solids enter the sampler by pushing past the inward-bending blades and are trapped by the steel blades. Because this method requires the waste to be amenable to scoping it is limited by the compactness (harness) of the waste being sampled.

The sampling methods described above are selected based on the physical characteristics of the waste. In general, the applicability of sampling methods to waste types is shown in Table B.4.1.

Table B.4.1 General Applicability of the Permittees Sampling Methods to Tank Waste Types

Sampling Method	Waste Type
Bottle-on-string	Free-flowing liquids or slurries
Core sampler	Solids (thick layer). May also be used for liquids and slurries.
Clamshell sampler	Solids (thin layer) and slurries.
Finger trap sampler	Solids (thin layer).

B.4.3 Maintaining and Decontaminating Field Equipment

All equipment used to collect and transport samples must be free of contamination that could alter test results. All equipment used to obtain and contain samples must be clean. Sampling equipment can be used equipment as long as it has been cleaned to remove contamination that could alter analytical results. New equipment can be used as long as it does not contain manufacturing or packaging residues that could affect analytical results. After use, sampling equipment that has contacted tank waste is either decontaminated or properly managed as waste.

B.4.4 Sample Preservation and Storage

Sample preservation must follow procedures set forth for the specific analysis identified in the appropriate tank characterization plan or sampling plan. Because of concerns with radioactivity, a deviation from the preservation requirements [WAC-173-303-110] may be required to adhere to 10 CFR 835, "Occupational Radiological Protection," requirements. DOE will notify Ecology if a deviation is required under the

AEA. Analyses conducted to meet requirements of this document must have been performed on either new samples or on archived samples that have been preserved and/or stored such that the analytical results would be comparable to that of a fresh sample (mathematical reconstitution of the sample is allowed).

B.4.5 Quality Assurance/Quality Control Procedures

WAC 173-303-110 contains specified sampling and testing methods that are used to comply with WAC 173-303 requirements (see Table B.4.2). The QA/QC requirements will vary according to the particular situation. The QA/QC requirements for sampling will be divided between documentation requirements, such as chain-of-custody and sampling and analysis activities. This section addresses sampling QA/QC requirements. Section B.5.0 addresses analytical procedures. Quality control procedures for tank sampling will be included in the tank-specific tank characterization plans and maintained in the DST operating record.

A chain of custody procedure is required for all sampling identified by this WAP. At a minimum, the chain of custody must include (1) a description of waste collected, (2) the names and dated signatures of samplers, (3) the date and time of collection and number of containers in the sample, (4) the names and dated signatures of persons involved in transferring the samples, and (5) required analysis.

The QA/QC activities for sampling consist primarily of checking for contamination through blanks. If QA/QC procedures for blanks and duplicates have been specified in a pertinent DQO, sampling or analysis plan, the procedures specified in the DQO or plan must be followed. If the procedures for blanks and duplicates have not been specified, the following steps should be used for every sampling event.

1. Check for sampling equipment contamination by taking at least one sample of an equipment rinse for each sampling event. In most instances, there is no need to take a sample rinse if new equipment is used because there should be no residue that could affect analytical results.
2. Check for general replicability of results by taking at least one set of field duplicates and by requiring the laboratory to conduct a duplicate spike on at least one sample.

Whenever blanks and/or duplicates are taken, they must be treated as if they are actual samples. This treatment includes, but is not limited to, adding the same amount of preservatives to blanks as is added to the samples and storing the blanks and duplicates in the same manner as samples.

Table B.4.2 General Applicability of the Permittees Sampling Methods to Tank Waste Types for meeting WAC 173-303-110

Waste Form	Waste Type	Equipment*
Liquids	Free flowing liquids and slurries	Composite Liquid Waste Sampler, SW-846, Chapter 9, glass thief or pipet, or 219 S Waste Handling Facility sampling system
Solidified liquids	Sludges	Trier, SW-846, Chapter 9, scoops and shovels
Sludges	Sludges	Trier, SW-846, Chapter 9, scoops and shovels
Soils	Sand or packed powders and granules	Auger, SW 846, Chapter 9, scoops and shovels
Absorbents	Large grained solids	Large trier, SW 846, Chapter 9, scoops and shovels
Wet absorbents	Moist powders or granules	Trier, SW 846, Chapter 9, scoops and shovels
	Moist powders or granules	Trier, SW 846, Chapter 9, scoops and shovels
	Dry powders or granules	Thief, SW 846, Chapter 9, scoops and shovels
Process solids and salts	Sand or packed powders and granules	Auger, SW 846, Chapter 9, scoops and shovels
	Large grained solids	Large trier, SW 846, Chapter 9, scoops and shovels
	Moist powders or granules	Trier, SW 846, Chapter 9, scoops and shovels
Ion exchange resins	Dry powders or granules	Thief, SW 846, Chapter 9, scoops and shovels
	Sand or packed powders and granules	Auger, SW 846, Chapter 9, scoops and shovels

*SW-846, 1992, *Test Methods for Evaluation Solid Waste: Physical/Chemical Methods*, U.S. Environmental Protection Agency, Washington, D.C.

B.4.6 Health and Safety Protocols

Safety and health protocol requirements are unit specific and are incorporated into activity specific sampling procedures. One important consideration is to keep all exposure ALARA. Because each sampling activity may be different, the specific protocols for ALARA and health and safety are not specified in this document, but they are included in the sample-specific procedures written for each sample collection activity. Specific requirements relating to safety and health protocols that are in pertinent DQOs, WAPs, and SAPs also must be followed for all samples required in this document. Specific hazards associated with the sampling efforts are evaluated during the work planning process and controls are implemented as required to mitigate any hazards.

B.5 LABORATORY SELECTION AND TESTING AND ANALYTICAL METHODS

This section addresses laboratory selection and testing and analytic methods.

B.5.1 Laboratory Selection

Laboratory selection is limited because only a few laboratories are equipped with the special equipment and procedures required to minimize personnel exposure when handling mixed waste. Although preference will be given to a laboratory on the Hanford Site, an offsite laboratory may be used. The laboratory is selected based on laboratory capability, nature of the sample, timing requirements, and cost. At a minimum, the selected laboratory must provide data with sufficient quality to meet the requirements for making decisions described in the applicable DQOs.

B.5.2 Testing and Analytical Methods

Double-shell tank customers will need to conduct analyses as necessary to provide information for completing a waste stream profile (see Section. B.2.2.1.1) The Permittees also may conduct additional analyses to determine compatibility, safety, and operating information. Testing and analytical methods will depend on the type of analysis sought and the reason for needing the information. In general, analytical and QA/QC requirements for TSDs transferring waste into the DSTs are listed in Tables B.5.1 and B.5.2. Analytical methods will be selected from Table B.5.1 and other sources as necessary; however, all analytical methods will be compliant with WAC 173-303-110.

Double-shell tank customers are expected to obtain analyses under the following circumstances (1) no process knowledge on a particular constituent is available, (2) confirmation of process knowledge is necessary (i.e. the validity of the knowledge is suspect), and (3) provide analyses needed for confirmation as required in Section B.6.0 of this document. Table B.5.1 shows the analyses that are needed for confirmation and the test methods. WAC 173-303-110 contains information that should be considered when selecting analytical methods. The analytical method(s) selected must be identified in the analysis plan submitted to the Permittees.

The sampling of waste stored in the DST System will follow the methods specified by applicable DQOs. If analytical methods have not been specified in a DQO or analysis plan, the Permittees have the responsibility for selecting the appropriate method.

1

**Table B.5.1 Minimum Analytical Methods used by the Treatment, Storage, and Disposal Unit
Transferring Waste into the Double-Shell Tank**

Typical Analytical Parameters	Method (SW-846 Method)*
Volatile organic compounds (VOC)	GC/MS (8260[1])
Semi-volatile organic compounds (SVOC)	GC/MS (8270[1])
PCBs	GC/ECD (8082)
Inorganic cations	ICP/AES (6010[1]), ICP/MS (6020), GFAA (7060[1])
Mercury	CVAA (7470[1] for liquids and 7471 for solids)
Inorganic anions	IC (9056)
Cyanide	Spectrophotometry (9014)
Sulfide	Ion selective electrode (9215)
pH or hydroxide	pH meter (9040), potentiometric titration
TOC/TIC	Persulfate oxidation (9060)

AES = atomic emission spectrometer.
CVAA = cold vapor atomic absorption.
ECD = electron capture detector.
GC = gas chromatograph.
GEA = gamma energy analysis.
GFAA = graphite-furnace atomic absorption.
ICP = inductively coupled plasma
MS = mass spectrometer
PCB = polychlorinated biphenyl.
SVOC = semi-volatile organic compounds.
TIC = total inorganic carbon.
TOC= total organic carbon.

2 [1] Most current method will be used. If the most current method cannot be used due to ALARA or matrix concerns,
3 then justification for using an older method will be placed in the operating record for Ecology review and approval.

4

Table B.5.2 Minimum Quality Control Requirements for Analytical Methods

Parameter	Standard	Matrix Spike	Laboratory Duplicate	Blank
Volatile organic analysis	**X**	**X**	**X**	**X**
Semi-volatile organic compounds (SVOC)	**X**	**X**	**X**	**X**
PCBs	**X**	**X**	**X**	**X**
Inorganic cations	X	X	X	X
Mercury	X	X	X	X
Inorganic anions	X	X	X	X
Cyanide	X	X	X	X
Sulfide	X	X	X	X
pH or hydroxide	X	NA	X	NA
Total organic carbon./Tentatively Identified Compounds	X	X	X	X

X= means that the QC requirement is required for the given parameter.
N/A= not applicable.

B.6 WASTE CONFIRMATION

Waste confirmation is directed by the Permittees. Waste confirmation pertains to sampling and analysis activities for both external transfers and internal waste transfers.

The potential for compatibility problems is thought to be greatest for mixing incoming waste with waste already in the DST System, but the potential for compatibility problems from mixing different wastes that are already in the DST System also exists. Section B.6.1 discusses confirmation of waste received into the DST System in detail. Section B.6.2 contains the requirements concerning confirmation of DST–to–DST System transfers.

B.6.1 Confirmation of Waste Received by the Double-Shell Tank System

With the except of waste from the 242-A Evaporator drains and pump room sump, external waste transfers to the DST TSD require the use of a WSP. The WSP is used along with characterization data to document the waste composition for waste acceptance evaluation. Confirmation for every waste stream consists of initial sampling and analysis of all compounds on the list of analytes (Table B.3.1). Confirmation also includes periodic sampling and analysis to verify the waste has not changed. Note: use of WSPs is for external transfers into the DST System only, not for transfers within the DST system or from the 242-A Evaporator drains and pump room sump.

For waste entering the DST system from outside generators or shippers (other than SST waste), a minimum of two independent samples is required. Data obtained from these samples is used to confirm whether the waste meets DST System waste acceptance criteria. Table B.6.1 contains general requirements for confirmation and Table B.6.2 contains confirmation requirements for waste transferred from different types of sources. If discrepancies are found between information contained in the WSP and confirmation sampling and analytical results, the discrepancy will be resolved as described in Section B.6.1.2.

Initial characterization determines that the parameter is within the expected concentration indicated in the WSP. Periodic reevaluation provides the confirmation that the composition of the waste has not changed. Periodic reevaluation by sampling and analysis must occur as specified in Table B.6.2. For most waste streams, this will be at least annually after the initial confirmation, but may occur more frequently.

Table B.6.1 List of General Requirements For Initial and Periodic Waste Confirmation Analyses

Initial confirmation
1. Unless specified otherwise in Table B.6.2, sampling must have been completed within 2 years of waste shipment. 2. Sampling and analysis must have been completed as quickly as feasible after sampling but in all cases must have been completed before such a time that would adversely impact the analytical result. 3. Sampling and analysis do not have to be completed before submitting the WSP as long as all required analytical data are completed and submitted to the Permittees before actual shipment of the waste.
Periodic confirmation
1. Sampling and analysis required for continuing confirmation must be submitted to the Permittees at the time that the waste stream profile is renewed unless specified otherwise in Table B.6.2. 2. Results of analyses must not be discrepant as defined in Section B.6.1.1.

Table B.6.2 Minimum Waste Confirmation Analytical Requirements for Waste Transfers into the Double-Shell Tank System

	Type of waste stream	Initial confirmation	Periodic confirmation
1.	242-A Evaporator slurry to Double-Shell Tank (DST) System	Sampling and Analysis as required by the latest revision of RPP-29002 before each campaign. To fulfill this requirement, the sample can be taken from the slurry as it exits the Evaporator or from the receiving slurry tank. Note that Evaporator training or cold runs do not require sampling and analysis.	The requirements for initial confirmation must be repeated for each campaign.
2.	Laboratory Waste	Sampling and analysis of the entire Table B.3.1 list of parameters.	Sampling and analysis listed in Table B.3.1of this WAP for each batch transfer.
3.	Single-Shell Tanks (SST)–to–DST System	Sampling and analysis of the entire Table B.3.1 list of parameters for each tank within 10 years of beginning the waste shipment. For SSTs that have been identified as caustic deficient, a sample is required within 2 years of waste shipment, unless mitigating actions are taken that address the caustic deficiency.	None for “interim stabilization” activities in which only supernatant or interstitial fluid is transferred. For retrieval operations that occur in stages, confirmation of the receiving tank after each retrieval stage is acceptable provided that any needed adjustments to the receiving tank are made before any subsequent transfers. For any other long-term activity not covered above, analysis of Table B.3.1 analytes for each tank is required every 2 years.
4.	Rainwater/ snowmelt collected in pits, vaults sumps, catch tanks, and IMUSTs etc. that do not contain other than trace amounts of other wastes.	Confirmation of process knowledge that the waste is primarily from precipitation by analysis for pH, electrical conductivity, and/or specific gravity.	Same as initial confirmation upon confirmation that tank waste may have been introduced.
5.	Inhibited (Sodium Hydroxide) water, raw water added as flushed during transfers, raw water with antifoaming agent, process condensate, equipment rinsate, and rain water intrusion.	Process Knowledge and/or addition controlled by operating procedure or work package	N/A

B.6.1.1 Determination of Discrepancy

Two types of discrepancies exist. A Type I discrepancy occurs when the confirmation sample is outside established limits. A Type II discrepancy exists if the confirmation sample is outside the historical range of confirmation analyses.

Type I discrepancies are determined by comparing the confirmation sampling and analysis result to the information contained in the WSP and to the compatibility assessment. If the result is outside a limit established for safe operation, a Type II discrepancy exists. In determining whether a discrepancy exists, the number of reported significant figures must be used.

A Type II discrepancy occurs when a confirmation sampling and analysis result is outside the range established by historical confirmation analyses. The Permittees will make this determination by reviewing the historical confirmation results and information provided by the waste shipper to determine whether the waste stream may have changed. A discrepancy will be deemed to have occurred if the change in the result is greater than 10% of the previous maximum confirmation result.

B.6.1.2 Resolution of Discrepancies Between Waste Stream Profile and Actual Analysis

Any discrepancy identified in Section B.6.1.1 must be resolved before shipping waste. Confirmation sampling frequency is provided in Tables B.6.1 and B.6.2. Resolution of discrepant analytes includes the following key requirements:

1. Before the waste can be shipped, the discrepancy with the WSP must be evaluated to determine whether it will result in compatibility or operational problems. If the Permittees determines that the discrepant waste is within the acceptance limits contained within this WAP the discrepancy will be documented and the shipment of that particular batch can proceed. If the discrepancy with the WSP has the potential to result in operational or safety problems, the waste shipment will be rejected pending resolution of the issues.
2. If the discrepancy with the WSP is not the result of a one-time event, the WSP must be revised by the waste shipper and approved by the Permittees before the next shipment of that waste stream.
3. All discrepancies must be confirmed by reanalyzing the waste stream.

B.6.2 Confirmation for Shipments Within the Double-Shell Tank System

Transfers from DST–to–DST are allowed only after a compatibility assessment has been completed. Waste compatibility assessments document the waste composition of the source(s) before waste transfers and the expected waste composition of the final mixture. Waste transfer confirmation within the DST System is addressed through engineering process controls and associated sampling and analysis per the waste acceptance criteria described in this WAP (see Section B.2.2).

B.7 SPECIAL PROCEDURAL REQUIREMENTS

This section describes the special procedural requirements associated with wastes generated offsite: ignitable, reactive, and incompatible wastes; and compliance with LDR.

B.7.1 Procedures for Receiving Wastes Generated Offsite

The DST System has not accepted waste shipments that originate off the Hanford Site. Before accepting any such waste, a system to ensure regulatory requirements pertaining to such a shipment will be instituted.

B.7.2 Provisions for Complying With Land Disposal Restrictions

Land disposal restrictions are codified in 40 CFR 268 and WAC 173-303-140. These regulations are designed to ensure that dangerous (hazardous) waste meets specified standards before its disposal to land.

The LDR requirements attach at the point of generation and must be met before disposal. LDR requirements are tracked by having waste shippers identify LDR requirements in the WSP and on waste transfer documentation. The DST System is not a land disposal unit so LDR requirements pertaining to incoming wastes are passed along to the subsequent treatment unit. No treatment or segregation is performed to meet LDR requirements in the DST System. Any applicable LDR storage/treatment/prohibition requirements mandated under 40 CFR 268 are identified in the Waste Stream Profile that is submitted as part of the approval process. Polychlorinated biphenyl storage prohibition under 40 CFR 268.50(f) is addressed as part of the framework agreement between DOE, Ecology, and EPA (Ecology et al., 2000**)**.

Because the DST System does not provide treatment for LDR requirements, and all requirements for incoming waste are passed along when the waste is transferred to another unit, there is no need to conduct sampling and analysis to determine the LDR status of the DST System waste.

REFERENCES

10 CFR 830, "Nuclear Safety Management," *Code of Federal Regulations*, as amended.

10 CFR 835, "Occupational Radiological Protection," *Code of Federal Regulations*, as amended.

40 CFR 268, "Protection of Environment" "Land Disposal Restrictions," *Code of Federal Regulations*, as amended.

55 FR 22666, "Land Disposal Restrictions for Third Scheduled Wastes," *Federal Register*, June 28, 1996, Vol. 61, pp. 33680-33691

ASTM E-300-03 "Standard Practice for Sampling Industrial Chemicals," ASTM International. For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org.

Atomic Energy Act of 1954, as amended, 42 USC 2011 et seq.

Banning D.L., 2005, *Data Quality Objectives (DQO)for Tank Farms Waste Compatibility Program*, SD-WM-DQO-001 (most current revision), CH2M HILL Hanford Group, Richland Washington.

DNFSB 93-5, "Waste Tank Characterization Studies," Defense Nuclear Facilities Safety Board Recommendation, http://www.dnfsb.gov/pub_docs.

DOE, 2001, *Federal Facility Agreement and Consent Order Change Control Form-Add Tri-Party Agreement Milestone Series M-48, M-48-01*, U.S. Department of Energy, Richland, Washington.

DOE/RL-88-21, *Hanford Facility Dangerous Waste Part A Permit Application*, as amended, U.S. Department of Energy, Richland, Operations Office, Richland, Washington.

DOE/RL-90-39, (Rev 1B) *Double-Shell Tank System Part B Dangerous Waste Permit Application*, as amended, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology et al. 1989, *Hanford Federal Facility Agreement and Consent Order*, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington, as amended.

EPA QA/G4, *Guidance for the Data Quality Objectives Process*, EPA/600/R-96/055, U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C.

PB94-963603, OSWER 9938.4 03, 1994, "Waste Analysis at Facilities That Generate, Treat, Store, and Dispose of Hazardous Wastes," U.S. Environmental Protection Agency, Washington, D.C.

RPP-8532, 2005, *Double-Shell Tank Chemistry Control. D.L Banning et.al*, Richland, Washington.

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

SW 846, *Test Methods for Evaluation Solid Waste Physical/Chemical Methods*, 3rd Edition, as amended by Updates I (July, 1992), IIA (August, 1993), IIB (January, 1995), III(A and B), and IV (January, 2008) U.S. Environmental Protection Agency, Washington, D.C.

Tank Waste Information Network System (TWINS), http://twins.pnl.gov.

WAC 173-303, 2005, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

This page intentionally left blank.