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**ADDENDUM B1
WASTE TREATMENT PLANT WASTE ANALYSIS PLAN**

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ADDENDUM B1
WASTE TREATMENT PLANT WASTE ANALYSIS PLAN

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ALARA	as low as reasonably achievable
ASTM	American Society for Testing and Materials
BNI	Bechtel National, Inc.
CFR	<i>Code of Federal Regulations</i>
DOE	United States Department of Energy
DOE-RL	United States Department of Energy, Richland Operations Office
DST	double-shell tank
DWPA	<i>Dangerous Waste Permit Application for the – Waste Treatment and Immobilization Plant</i>
RDQO	<i>Regulatory Data Quality Objectives Optimization Report</i>
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ETF	Effluent Treatment Facility
HEME	high-efficiency mist eliminator
HEPA	high-efficiency particulate air (filter)
HLVIT	high-level vitrification
HLW	high-level waste
HSSWAC	<i>Hanford Site Solid Waste Acceptance Criteria</i>
HSLWAC	<i>Hanford Site Liquid Waste Acceptance Criteria</i>
ICN	integrated control network
ID	identification
IHLW	immobilized high-level waste
ILAW	immobilized low-activity waste
LAW	low-activity waste
LDR	Land Disposal Restrictions
LERF	Liquid Effluent Retention Facility
LIMS	laboratory information management system
LSM	locally-shielded melter
MSDS	material safety data sheet
NRC	Nuclear Regulatory Commission

PCB	Polychlorinated Biphenyl
PIN	plant information network
QA	quality assurance
QAPJP	<i>Quality Assurance Project Plan for the Waste Analysis Plan</i>
QC	quality control
RCRA	Resource Conservation and Recovery Act of 1976
TOC	total organic carbon
TRU	transuranic elements
TSD	treatment, storage, or disposal (facility)
WAC	<i>Washington Administrative Code</i>
WAP	waste analysis plan
WTIS	waste tracking and inventory system
WTP	Waste Treatment and Immobilization Plant

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Glossary

This waste analysis plan (WAP) relies on the definitions of terms as contained in the draft *Hanford Facility Dangerous Waste Permit* (Ecology 2011) and the Dangerous Waste Permit Application for the Waste Treatment and Immobilization Plant (DWPA) (Addendum A), except as supplemented or amended below.

- Batch Retrievable waste staged in a single double-shell tank (DST) designated as mixed waste for transfer to the Waste Treatment Plant (WTP) for treatment.
- Feed verification The activities the WTP will perform to verify that the staged waste feed meets the WTP acceptance criteria.
- Feed confirmation The activities the WTP will perform after receiving the waste feed, to confirm that the waste feed received is the same as the waste feed accepted for delivery.
- Immobilization The act or process of reducing the mobility of waste constituents to limit their potential for long-term transport in the biosphere and subsequent exposure to humans, animals, and plants. Vitrification is an example of an immobilization process.

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1 **1.0 INTRODUCTION**

2 This Waste Analysis Plan (WAP) describes the sampling and analysis for dangerous waste constituents
3 for the Waste Treatment and Immobilization Plant (WTP) to comply with the Washington State
4 Dangerous Waste Regulations contained in Chapter 173-303 of the *Washington Administrative*
5 *Code* (WAC). It was prepared in accordance with the requirements of WAC 173-303-110, "Sampling
6 and Testing Methods," WAC 173-303-300, "General Waste Analysis," WAC 173-303-806, "Final
7 Facility Permits," and the draft *Hanford Facility Dangerous Waste Permit* (Ecology 2011). Some
8 non-dangerous constituents are also discussed in this plan if they support compliance activities or if the
9 discussion provides a more complete description of a particular sampling strategy. The descriptions in
10 this plan of the waste feed stored at the Hanford Site double-shell and single-shell tank system units
11 (collectively referred to as Hanford tank waste) and the planned process streams are based on available
12 chemical and physical information and process knowledge.

13 Reactor fuel reprocessing is the primary source of waste material stored in the Hanford double-shell and
14 single-shell tanks. Minor amounts of other radioactive and mixed waste (such as low-level and
15 transuranic waste) are also included in the double-shell tanks; however, the tank waste is managed as
16 high-level waste (HLW) prior to treatment and vitrification. The waste feed to the WTP will consist of
17 staged transfers of mixed waste from the double shell tank (DST) system unit. This waste is composed of
18 sludge, salt cake, and liquids, and is considered mixed waste as defined by WAC 173-303; that is, it
19 contains both radioactive and dangerous waste.

20 HLW is defined by the United States Nuclear Regulatory Commission (NRC) in the *Code of Federal*
21 *Regulations*, 10 CFR 72.3, as:

22 " (1) the highly radioactive material resulting from the reprocessing of spent nuclear fuel,
23 including liquid waste produced directly in reprocessing and any solid material derived from such
24 liquid waste that contains fission products in sufficient concentrations; and (2) other highly
25 radioactive material that the Commission, consistent with existing law, determines by rule
26 requires permanent isolation."

27 Hanford tank waste is consistent with the HLW definition. The treatment of the Hanford tank waste is
28 required under the *Hanford Federal Facility Agreement and Consent Order* (Ecology, EPA, and
29 DOE 1996), signed by the Washington State Department of Ecology (Ecology), the United States
30 Environmental Protection Agency (EPA), and the United States Department of Energy (USDOE).

31 In a letter to the Richland DOE Operations Office (DOE-RL) (Paperiello, 1997), the NRC documented an
32 agreement with DOE to classify a portion of the Hanford tank waste as "incidental waste" in accordance
33 with the incidental waste classification criteria specified in an earlier letter from the NRC to DOE
34 (Bernero, 1993). The lower activity portion of the tank waste, referred to as low-activity waste (LAW)
35 feed, generally refers to the supernatant portion of the tank waste. Following radionuclide removal and
36 vitrification, the immobilized low-activity waste (ILAW) will be considered incidental waste, disposed of
37 onsite at Hanford as low-level waste, and will not be subject to the licensing authority of the NRC,
38 consistent with the NRC incidental waste determination. The ILAW will be managed as mixed waste for
39 disposal.

40 The higher activity and higher solids portion of the tank waste is designated as HLW feed in the
41 *Dangerous Waste Permit Application for the Waste Treatment and Immobilization Plant* (DWPA). The
42 two different terms describing the Hanford tank waste are used because the LAW and HLW fractions of
43 the waste feed are processed differently in the WTP, as described in Section 2 of this WAP.

44 The DST system unit will provide a waste profile and, upon request, a split sample aliquot for each waste
45 feed that is staged for transfer to the WTP. The WTP will perform verification analysis on the aliquot to
46 determine if the waste feed meets WTP acceptance criteria. The WTP will also compare the volume of
47 waste feed transferred from the DST feed staging tank with the volume received into the feed receipt

1 tanks at the WTP, to confirm that the waste feed received corresponds to the waste feed accepted for
2 transfer.

3 The WTP will characterize the DST waste feed in conformance with the *Regulatory Data Quality*
4 *Objectives Optimization Report* (RDQO Optimization) process (24590-WTP-RPT-MGT-04-001).
5 Characterization of the DST waste feed will be completed prior to transfer to the WTP.

6 Simplified process flow figures of the operations at the WTP are included in Addendum C1.

7 Controlled copies of this WAP will be kept at the WTP facility. The Project Document Control Manager,
8 or equivalent title, will be responsible for ensuring that controlled copies of the WAP are kept current
9 when revisions to the WAP are made.

10 **2.0 WASTE TREATMENT PLANT UNIT DESCRIPTION**

11 The WTP is a waste treatment unit described under the unit-specific portion of the draft *Hanford Facility*
12 *Dangerous Waste Permit* (Ecology 2011). A plan view of the WTP is located in Addendum A. This
13 section briefly describes the WTP processes and activities. More detailed process information is provided
14 in Addendum C.

15 Figure B1-1 is a simplified diagram of the treatment components, showing the relationship between:

- 16 • Waste feed
- 17 • Pretreatment
- 18 • LAW vitrification
- 19 • HLW vitrification

20 Plant equipment will include:

- 21 • Pipelines, tanks, and ancillary equipment
- 22 • Evaporation units
- 23 • Ultrafiltration units
- 24 • Ion-exchange columns
- 25 • Chemical addition equipment
- 26 • LAW and HLW melters
- 27 • Service and utility units
- 28 • Container management units
- 29 • Storage facilities
- 30 • Off-gas treatment systems.

31 The pretreatment and vitrification of the waste feed and the management of off-gas from these processes
32 are described in the following sections. The applicability of air emissions standards to the WTP is also
33 discussed.

34 **2.1 Pretreatment**

35 Pretreatment will prepare the DST waste feed for vitrification. An overview of the pretreatment processes
36 is provided below and illustrated in Figure B1-1. Descriptions of the feed receipt tanks and pretreatment
37 equipment are provided in Addendum C.

38

39 Pretreatment of the waste feed will consist of the following processes:

40

- 41 • Concentration of the waste feed by evaporation.

- 1 • Separation of entrained solids by ultrafiltration.
- 2 • Separation of strontium and transuranic elements (TRU) by precipitation and ultrafiltration.
- 3 • Separation of cesium in an ion exchange unit.
- 4 • Final concentration by evaporation for the LAW feed.

5 The following paragraphs provide a description of these processes.

6 After the receipt of the waste feed from the DST system unit, the waste feed evaporator, a
7 forced-circulation vacuum evaporator, will concentrate the waste feed prior to ultrafiltration.
8 Ultrafiltration will remove entrained solids from the concentrated waste feed. The solids will be washed
9 and will either be transferred to the HLW feed or returned to the DST system unit. For certain waste feed,
10 strontium and TRU will be precipitated by adding reagents to the waste feed. The precipitate containing
11 strontium and TRU will be concentrated and washed in the ultrafiltration system before incorporation into
12 the HLW feed.

13 Condensate from the evaporator off-gas streams will be collected and transferred to condensate tanks for
14 discharge to the Liquid Effluent Retention Facility (LERF) or the Effluent Treatment Facility (ETF), or
15 both, for subsequent treatment. Non-condensable gases that are extracted from the evaporator system will
16 be routed to the pretreatment process tank ventilation off-gas treatment system. Refer to Section 2.3.1 for
17 a description of the pretreatment off-gas treatment systems.

18 The liquid separated by ultrafiltration will become the LAW feed. The LAW feed will pass through the
19 cesium ion exchange system to separate cesium from the LAW feed. The cesium will be blended with the
20 HLW feed.

21 The LAW feed leaving the ion exchange unit will be concentrated by evaporation in the LAW melter feed
22 evaporator. The operation of the LAW melter feed evaporator will be similar to that of the waste feed
23 evaporator. The pretreated LAW feed will be transferred to the LAW vitrification plant for vitrification
24 into the ILAW glass product.

25 The HLW feed will then consist of washed solids, strontium and TRU precipitates for certain feed
26 streams, and the cesium ion exchange product. The blended HLW feed will be transferred to the HLW
27 vitrification plant for vitrification into the immobilized high-level waste (IHLW) glass product.

28 **2.2 Vitrification Systems**

29 After pretreatment, LAW feed will be transferred to the LAW vitrification plant, and HLW feed will be
30 transferred to the HLW vitrification plant, for conversion to the immobilized glass product.

31 **2.2.1 Low-Activity Waste Vitrification**

32 The pretreated and concentrated LAW feed exiting the LAW melter feed evaporator will be combined
33 with necessary glass-forming additives (for example, Silica, Alumina, Boric Acid, and Calcium Silicate)
34 and reductants. The slurry of waste feed and glass formers will be transferred to the LAW melter feed
35 tanks in a manner to provide a continuous feed to each of the two LAW melters. The electric-powered,
36 joule-heated LAW melters will operate in parallel. The temperature of the molten glass in the melters
37 will be approximately 950° C to 1,250° C.

38 In the melter, the feed components will be converted to their respective oxides and dissolved in the melt,
39 destroyed by the high temperatures, or partitioned to the off-gas. As these materials are heated,
40 superheated gases will be released into the melter off-gas system. Here, most of the solids entrained in
41 the off-gas will be captured and returned to the waste feed stream for treatment. The LAW off-gas
42 treatment system will treat the volatile constituents that remain in the off-gas. LAW off-gas treatment is
43 discussed in Section 2.3.2.

1 Molten glass will be discharged from the melters to stainless steel containers for cooling, solidification,
2 and storage. The process will yield a durable glass containing the ILAW. The glass will be cooled and
3 the container sealed, decontaminated, and temporarily stored before being transferred to an appropriate
4 Hanford Site treatment, storage, or disposal (TSD) unit.

5 **2.2.2 High-Level Waste Vitrification**

6 The HLW vitrification system will receive feed slurry from the HLW pretreatment process. The feed
7 slurry will be combined with necessary glass-forming additives (Silica, Boric Acid, Calcium Silicate,
8 Ferric Oxide, and Lithium Carbonate) and reductants, and will then be fed to each of the two HLW
9 melters. The temperature of the molten glass in the HLW melter will be approximately 950° C to 1,250°
10 C.

11 In the melter, feed components will be converted to their respective oxides and dissolved in the melt,
12 destroyed by the high temperatures, or partitioned to the off-gas. As these materials are heated,
13 superheated gases, including volatile feed components, will be released into the melter off-gas system,
14 where most of the solids entrained in the off-gas will be captured and returned to the waste feed stream
15 for treatment. The HLW off-gas treatment system will treat the volatile constituents that remain in the
16 off-gas. The HLW off-gas treatment system is discussed in Section 2.3.3.

17 Molten glass will be discharged from the HLW melters to stainless steel canisters for cooling,
18 solidification, and storage. The process will yield a durable glass containing IHLW. The glass will be
19 cooled and the canister sealed, decontaminated, and temporarily stored before being transferred to the
20 Hanford Canister Storage Building unit for storage until final disposal.

21 **2.3 Off-gas Treatment System**

22 The pretreatment plant, the LAW vitrification plant, and the HLW vitrification plant will each have a
23 dedicated off-gas treatment system. These systems are described in the following sections. The off-gas
24 treatment systems are illustrated in Figure B1-1. Air emissions are addressed in Section 2.4. Details
25 regarding the off-gas treatment system components are discussed in Addendum C.

26 **2.3.1 Pretreatment Plant Off-gas**

27 B1-1 illustrates the pretreatment plant off-gas treatment system. The pretreatment off-gas from fluidic
28 devices will be treated through a high-efficiency mist eliminator (HEME) and high-efficiency particulate
29 air (HEPA) filter, and routed to the pretreatment plant stack, where it will be monitored and released to
30 the atmosphere.

31 The pretreatment off-gas from vessels will be treated through the following components operating in
32 series:

- 33 • Acid gas scrubber
- 34 • HEME
- 35 • HEPA filter
- 36 • Volatile organic compound oxidizer
- 37 • Carbon adsorber.

38 The treated pretreatment off-gas from vessels will be monitored and released to the atmosphere through
39 the pretreatment plant stack.

40 **2.3.2 Low-Activity Waste Vitrification Off-gas**

41 The LAW melter off-gas treatment system will consist of the following components operating in series, as
42 illustrated in Figure B1-1:

- 43 • Film cooler

- 1 • Submerged bed scrubber
- 2 • Wet electrostatic precipitator
- 3 • HEPA filter
- 4 • Activated carbon adsorber
- 5 • Thermal catalytic oxidation unit
- 6 • Selective catalytic reduction unit
- 7 • Caustic scrubber.

8 The treated LAW off-gas will be monitored and released through the LAW stack.

9 **2.3.3 High-Level Waste Vitrification Off-gas**

10 The HLW melter off-gas treatment system will consist of the following components operating in series, as
11 illustrated in Figure B1-1:

- 12 • Film cooler
- 13 • Submerged bed scrubber
- 14 • Wet electrostatic precipitator
- 15 • HEME
- 16 • HEPA filter.
- 17 • Activated carbon adsorber
- 18 • Silver mordenite iodine adsorption unit
- 19 • Thermal catalytic oxidation unit
- 20 • Selective catalytic reduction unit

21 The treated HLW off-gas will be monitored and released through the HLW stack.

22 **2.4 Air Emissions**

23 Emissions from the stacks that vent the WTP processes will be monitored according to the provisions of
24 the WTP and Hanford Site Air Operating Permit, as required by WAC 173-303-395(2). Monitoring and
25 sampling to address air emissions concerns under these permits will not be addressed in this application.
26 However, the applicability of the air emissions requirements found in WAC 173-303 will be evaluated in
27 the following sections. Details of the air emissions control systems for the WTP are provided in
28 Addendum C.

29 **2.4.1 Air Emissions from Process Vents (Subpart AA)**

30 WAC 173-303-690, commonly referred to as Subpart AA, regulates process vents that are associated with
31 distillation, fractionation, thin-film evaporation, solvent extraction, or air- or steam-stripping operations
32 that manage hazardous wastes with organic concentrations of at least 10 parts per million by weight.
33 WAC 173-303-690 incorporates the provisions of 40 CFR 264.1031 through 40 CFR 264.1036 by
34 reference. The WTP does not employ any of these listed devices or processes; therefore, the WTP is not
35 subject to regulation under Subpart AA.

36 **2.4.2 Air Emission Standards for Equipment Leaks (Subpart BB)**

37 WAC 173-303-691 applies to facilities that treat, store, or dispose of hazardous waste, and regulates air
38 emissions from equipment that contains or contacts hazardous wastes with organic concentrations of at
39 least 10 percent by weight. WAC 173-303-691 incorporates 40 CFR 264.1051 through 1065 (Subpart
40 BB) by reference. This provision does not apply to the WTP, because the WTP will not accept wastes

1 with organic concentrations at or above 10 percent by weight. Compliance with this provision will be
2 documented through analysis, as described in Section 3.4.1.

3 **2.4.3 Air Emission Standards for Tanks, Impoundments, and Containers (Subpart CC)**

4 The regulations specified under WAC 173-303-692 and 40 CFR Part 264 Subpart CC, incorporated by
5 reference, do not apply to the WTP mixed waste tank systems and containers. These tanks and containers
6 qualify as waste management units that are “used solely for the management of radioactive dangerous
7 waste in accordance with all applicable regulations under the authority of the Atomic Energy Act and the
8 Nuclear Waste Policy Act” and are excluded under WAC 173-303-692(1)(b)(vi). Containers or tanks
9 bearing non-radioactive, dangerous waste, such as maintenance and laboratory waste, that are not
10 excluded under WAC 173-303-692(1)(b)(ii) or 40 CFR 264.1082(c), will comply with the container and
11 tank standards specified under 40 CFR Part 264 Subpart CC.

12 **3.0 WASTE ACCEPTANCE**

13 The waste feed to be transferred from the DST system unit to the WTP will undergo several stages of
14 review before acceptance. The DST system unit will provide the WTP with a waste profile for the feed
15 batch staged for transfer to the WTP. If requested, the DST system unit will also provide an aliquot of the
16 split sample of the waste feed for waste verification analysis performed by the WTP. Verification
17 analytical data on the waste feed provided by the DST system unit will be accepted by the WTP for waste
18 acceptance purposes. During sampling and analysis for verification, the waste feed will remain within the
19 control and responsibility of the DST system unit.

20 After WTP personnel determine that the verification analysis results meet the waste acceptance criteria,
21 the DST system unit will be authorized in writing to transfer the waste feed through double-walled pipes
22 to feed receipt tanks located inside the WTP. After transfer, the WTP will compare the volume of waste
23 feed transferred from the DST feed staging tank with the volume received into the WTP feed receipt
24 tanks. This will confirm that the waste feed received corresponds to the waste feed that was accepted for
25 transfer.

26 The steps involved in evaluating and accepting the waste feed into the WTP are summarized in Table B1-
27 1, and are described in the following sections. Also discussed in the following sections is the rationale for
28 the removal of dangerous waste numbers D001 (ignitable) and D003 (reactive) from the waste feed and
29 the selection of analytical laboratories.

30 Dangerous waste will be managed in a way that will preclude adverse reaction or interference with the
31 WTP treatment process.

32 **3.1 Waste Feed Designation**

33 Waste numbers described in the *Double-Shell Tank System Unit Permit, Operating Group 12, Addendum*
34 *B, Waste Analysis Plan* (DOE-RL 2009) are applicable to the waste feed. A list of these dangerous waste
35 numbers is shown in Table B1-2. Table B1-2 includes multi-source leachate (F039) as a waste derived
36 from non-specific source wastes F001 through F005. Waste feed received from the DST system unit is
37 not expected to exhibit the characteristics of ignitability (D001) or reactivity (D003), based on process
38 knowledge. Section 3.6 describes the process knowledge that will be used to demonstrate that the waste
39 feed is not ignitable or reactive.

40 **3.2 Waste Feed Acceptance Process**

41 For each waste feed batch, the waste acceptance process is summarized in Table B1-1, and is discussed
42 in the remainder of this section.

3.2.1 Waste Feed Profile

The DST system unit will complete a profile of the waste feed batch before making a transfer of that batch to the WTP. The content and format of the profile will be established prior to the transfer of waste feed. An example of the information that will be provided in the profile is:

- General information, such as the identification of the DST tank from which the transfer will be made and the date of the proposed transfer.
- Physical properties of the waste feed, such as the proposed volume of the transfer and the presence or absence of a separate visible organic layer.
- Historical analytical data, such as total organic carbon (TOC).
- Dangerous waste information, such as the designation of dangerous waste numbers.
- Land disposal restriction (LDR) information.

3.2.2 Waste Feed Verification

At the request of the WTP, the DST system unit will supply a split sample aliquot of the staged waste feed for verification analysis. The aliquot will be analyzed by the WTP for the waste acceptance criteria parameters. The verification process is discussed in Section 3.3, and the waste acceptance criteria for verification are discussed in Section 3.4. If the waste acceptance criteria information is provided by the DST system unit for the staged waste feed, then the WTP will not need to repeat analyses for the provided information.

3.2.3 Preshipment Review

Verification analytical information will be obtained for each waste feed batch whether provided by the DST system unit or determined by the WTP through analysis of the DST split sample aliquot. The purpose of the preshipment review is to evaluate the verification analytical results to ensure compatibility and acceptability of the waste feed before it enters the WTP. If the verification analytical results are within the waste acceptance criteria limits, then the waste will be accepted for treatment. If the verification analytical results are outside of the waste acceptance criteria, then the DST system unit will be notified that the waste feed does not conform. Actions in response to non-conformance are addressed in Section 3.2.4.

Following successful completion of the preshipment review, including the resolution of any non-conformance, a representative of the WTP will notify DST system unit personnel in writing that the WTP is ready for a waste feed transfer. The position title of the WTP representative will be provided prior to the commencement of WTP operations. The two parties will agree on the waste feed transfer date, as well as any other pertinent information.

3.2.4 Non-Conformance Action

Confirmatory action, such as re-analysis and data review, will be performed for each verification analytical result that does not initially meet the acceptance criteria presented in Table B1-3. Re-analysis of a sample that fails an acceptance criteria will consist of two repeat analyses for the failed criteria. If both of the repeat analyses pass, then the sample will be considered to meet the acceptance criteria. If one or both of the repeat analyses fail, the waste will be considered non-conforming. If the waste feed is determined to be non-conforming, then the waste is returned to tank farms. The WTP, the DST system unit, or both, will determine and execute corrective actions necessary to be able to transfer back to WTP to process the waste feed.

The non-conformance decisions, corrective actions and supporting data, along with the names and titles of the individuals making these decisions, will be documented and retained as a quality assurance (QA) record, according to procedures described in the *Quality Assurance Project Plan for the Waste Analysis Plan* (QAPjP), Addendum B2.

1 **3.2.5 Waste Feed Transfer**

2 Waste feed transfer will be coordinated between the DST system unit and the WTP. Prior to waste feed
3 transfer, the WTP will ensure that waste feed transfer systems are operational. These systems include, but
4 are not limited to:

- 5 • Pipeline interstitial leak detection
- 6 • Feed receipt tank level measurement equipment
- 7 • Feed receipt tank ventilation

8 Once the transfer systems are confirmed as operational, the DST system unit will transfer the waste feed
9 to the WTP feed receipt tanks through a double-walled pipeline. The DST system unit will water flush
10 the pipeline after the transfer is complete.

11 **3.2.6 Waste Feed Confirmation**

12 The purpose of confirmation is to ensure that the waste feed received into the WTP is the same waste feed
13 that was accepted for transfer. The method used for confirmation will be a comparison of the volume
14 removed from the DST system unit feed staging tank with the volume received into the WTP feed receipt
15 tanks. The tank volume measurement systems for the DST system unit and the WTP are discussed in the
16 following sections.

17 **3.2.6.1 Confirmation Frequency, Measurement Locations, and Measurement Methods**

18 Volume measurements will be made from the DST system unit feed staging tank and the WTP feed
19 receipt tanks for each waste feed transfer. The locations of the waste feed confirmation measurements are
20 identified on Figure B1-1 as S1 for the DST system feed staging tank, and S2 for the WTP waste feed
21 receipt tanks.

22 The method for volume measurement at both the DST system unit feed staging tank and the WTP feed
23 receipt tanks will be tank level measurements taken before and after waste feed transfer. The volume is
24 then calculated from the tank level differences, taking into account the volume of the line flush water.

25 **3.2.6.2 Confirmation Volume Reconciliation**

26 The WTP and the DST system unit will reconcile any differences between the measured waste volume
27 transferred out of the DST staging tank and the measured volume received in the WTP waste feed receipt
28 system, including top-off transfers.

29 **3.3 Waste Feed Verification Process**

30 The purpose of verification is to determine whether the DST waste feed staged for transfer can be
31 properly managed in the WTP. Appropriate and reliable analytical information to make this
32 determination will be obtained through the activities discussed in the following sections.

33 **3.3.1 Verification Sampling and Frequency**

34 At the request of the WTP, the DST system unit will provide one split sample aliquot for each batch of
35 waste feed prior to transfer to the WTP. The sampling location for the waste feed verification is
36 identified on Figure B1-1 as sample point S1.

37 Verification analyses, which are the waste acceptance criteria, are listed in Table B1-3, and discussed in
38 Section 3.4. Methods for selecting a laboratory and establishing laboratory quality assurance (QA) and
39 quality control (QC) procedures are addressed in Section 3.5. Detailed QC information is provided in the
40 QAPjP.

1 **3.3.2 Verification Sampling Methods**

2 The verification split sample aliquot of the DST waste feed staged for transfer to the WTP will be
3 collected as described in Section 9.2 of the *Regulatory Data Quality Objectives Optimization Report*
4 (*RDQO Optimization*) (24590-WTP-RPT-MGT-04-001).

5 **3.3.3 Sample Preservation, Storage and Holding Times**

6 Sample preservation, storage, and holding times for the sample collected from the DST staging tank for
7 verification analysis are described in Section 9.7 of the *RDQO Optimization* (24590-WTP-RPT-MGT-04-
8 001).

9 **3.3.4 Sampling Quality Assurance and Quality Control**

10 Quality assurance and quality control for verification sampling activities performed by the DST system
11 unit are addressed in Sections 9.6 of the *RDQO Optimization* (24590-WTP-RPT-MGT-04-001).
12 Analytical laboratory quality assurance and quality control are discussed in Section 3.5.2.1 of this WAP.

13 **3.3.5 Selection of Verification Analytes**

14 The selected analytes for waste feed verification are:

- 15 • Total organic carbon (TOC)
- 16 • Polychlorinated biphenyls (PCBs)
- 17 • pH
- 18 • Compatibility

19 The analytical methods and waste acceptance criteria for each of these analytes are listed in Table B1-3
20 and discussed in Section 3.4.

21 The list of analytes for waste feed verification is described in the *RDQO Optimization* (24590-WTP-RPT-
22 *MGT-04-001*) and will be re-evaluated as a result of the environmental risk assessment, currently under
23 development and scheduled to be finalized during cold commissioning LAW and HLW demonstration
24 tests. The RDQO Optimization process is subject to periodic evaluation and may periodically affect the
25 list of analytes.

26 **3.3.6 Selection of Verification Analytical Methods**

27 Table B1-3 presents the currently selected SW-846 (EPA 1997a) preparation and analytical methods that
28 will be applied to the waste feed to verify that it is acceptable for treatment by the WTP. Any applicable
29 analytical method provided in WAC 173-303-110 may be used for analysis. If an analytical method used
30 for regulatory purposes other than the methods provided in WAC 173-303-110 is proposed, approval of
31 the method will be requested from Ecology, according to WAC 173-303-910(2). The proposed analytical
32 method will not be used for regulatory purposes until Ecology authorizes the method. If modifications to
33 a procedure are needed, they will be requested in accordance with WAC 173-303-110 (4). Specific
34 technical guidance for modification of SW-846 (EPA 1997a) methods will be obtained from *Guidance on*
35 *Testing Requirements* (NRC, EPA 1997), *Preparation of Radioactive Mixed Waste Samples*
36 (ASTM 1990), *Methods of Chemical Analysis* (PNL 1993), as well as recent publications (for example,
37 Mong and others, 1997). The SW-846 (EPA 1997a) “method hotline” indicates that sample size is not a
38 method modification, unless detection limits are not sufficient for making decisions.

39 **3.4 Waste Acceptance Criteria**

40 The following sections discuss the waste acceptance criteria that will be used for verification of the DST
41 waste feed. If the waste acceptance criteria information is provided by the DST system unit for the staged
42 waste feed, then the WTP will not repeat analyses for the provided information. Waste feed received into
43 the WTP that meets the waste acceptance criteria will be treated by the WTP.

1 **3.4.1 Total Organic Carbon**

2 The waste feed will be analyzed to determine the TOC. TOC has been chosen for analysis of the waste
3 feed to ensure that the WTP is not required to comply with Subpart BB found in WAC 173-303-691.
4 Proportionate liquid and solid aliquots of the split sample will be taken for this analysis.

5 The analytical method is SW-846 Method 9060 (EPA 1997a), or EPA Method 415.2 (EPA 1997b), using
6 persulfate oxidation. The sample aliquot volume requirements for this analysis are expected to be less
7 than 1 milliliter for liquid and 0.1 gram or less for solids. This method typically measures TOC to levels
8 of about 1 part per million. The acceptance level for this verification process is 10 percent TOC. In order
9 to preserve the liquid sample in accordance with Method 9060 (EPA 1997a), the liquid sample will be
10 diluted from 1 part per hundred to 1 part per thousand in water, with enough Sulfuric Acid added to
11 maintain the pH at less than 2 pH units. The dilution will be performed because of the high alkalinity and
12 the need to acidify for preservation. Even with the dilution, Method 9060 (EPA 1997a) will meet the
13 1 percent detection limit, as given in Table B1-3. The solids will be analyzed separately for TOC, and
14 will not be acidified or diluted.

15 **3.4.2 Polychlorinated Biphenyls**

16 Portions of the Hanford tank waste may contain PCBs at concentrations below 50 parts per million.
17 These are regulated under the Toxic Substances Control Act (TSCA 1976), and codified in 40 CFR
18 761.61 as PCB remediation waste (Fitzsimmons and others, 2000). The waste feed verification sample
19 aliquots will be analyzed to ensure that the waste feed contains less than 50 parts per million PCBs. This
20 acceptance criteria of 50 parts per million PCBs may change as a result of the risk-based approval of
21 PCBs in the Hanford tank waste that is being prepared jointly by USDOE, Ecology, and EPA.

22 The sample will be separated into solid and liquid phases and analyzed for PCBs by SW-846 Method
23 8082 (EPA 1997a). Modification of the basic extraction procedure given in this method is expected to be
24 needed to decrease the sample size and allow the extraction to be performed in a shielded glovebox. It is
25 anticipated that a sample size of 0.5 to 1 gram would be required for solids, and 10 to 20 milliliters for
26 liquids. If any single liquid sample contains more than 5 percent solids after centrifuging, the liquid and
27 solid will be analyzed separately. Refer to Table B1-3 for the acceptance criteria.

28 **3.4.3 Waste Feed pH**

29 The measurement of pH will ensure that a batch of waste feed is compatible with the WTP materials of
30 construction and treatment processes. SW-846 Method 9040 (EPA 1997a) will be used to measure pH.
31 The estimated sample size is 5 milliliters. The decision criteria is greater than pH 7, as presented in
32 Table B1-3.

33 **3.4.4 Waste Feed Compatibility**

34 The waste feed will be evaluated for compatibility with the residual aqueous waste in the WTP feed
35 receipt tanks, before being accepted into the WTP. These evaluations will focus on the potential for a
36 waste stream to react in an uncontrolled fashion with another waste (40 CFR 264, Appendix V,
37 "Examples of Potentially Incompatible Wastes"). Although problems associated with co-mingling
38 aqueous waste feeds are not expected, this evaluation will ensure the compatibility of two or more
39 aqueous waste feeds from different DST system unit tanks.

40 Waste feed compatibility will be evaluated using the American Society for Testing and Materials Method
41 (ASTM) D5058-90, *Standard Test Methods for Compatibility of Screening Analysis of Waste* (ASTM
42 2001). This evaluation provides three test methods to determine compatibility. Test method A, using a
43 reduced sample volume, will be applied to the proposed DST system unit waste feed and the WTP feed
44 receipt tank residual waste. This method prescribes the mixing of aliquots of the two waste streams and
45 an evaluation of any temperature change of the mixture. The method also calls for a visual examination

1 to determine whether viscosity has increased. These evaluations will be performed to test for potential
2 incompatibilities that could adversely affect the management of the waste in the WTP.

3 The recommended sample volume for this test method is 150 to 300 milliliters. The sample size will be
4 decreased to 10 milliliters from each waste feed source, for a total of 20 milliliters of the combined waste
5 feeds for waste minimization, and will comply with the as low as reasonably achievable (ALARA)
6 philosophy.

7 **3.5 Analytical Laboratory**

8 The following sections discuss the WTP's onsite analytical laboratory and the quality assurance and
9 quality control that will be implemented for analytical activities and for sampling performed by the WTP.
10 Also discussed is the selection of other analytical laboratories.

11 **3.5.1 Waste Treatment Plant Analytical Laboratory**

12 The WTP will establish and operate an onsite analytical laboratory. A laboratory quality assurance (QA)
13 program meeting the requirements of SW-846, Chapter 1, Section 4.4 (EPA 1997a) will be prepared
14 before initiation of laboratory operations.

15 **3.5.2 Establishing Quality Assurance and Quality Control Procedures**

16 The following sections discuss the quality assurance (QA) and quality control (QC) for the analytical
17 laboratory and for sampling operations.

18 **3.5.2.1 Laboratory QA and QC**

19 The WTP laboratory will conduct its operation in a way that ensures that reliable information is provided
20 on request. The policies and procedures described in the QAPjP will be implemented to ensure reliable
21 data.

22 Laboratory equipment and instrumentation will meet the requirements and specifications of the test
23 methods and other procedures described in the QAPjP.

24 The QAPjP will describe or refer to laboratory activities that may affect data quality. Any deviation from
25 an established procedure during a data collection activity will be documented. QC procedures will be
26 available for the indicated activities as described in the QAPjP.

27 The QAPjP describes how the following elements of the QC program will be implemented:

- 28 • Sample control
- 29 • Analyses
- 30 • Measures of precision, accuracy, and representativeness
- 31 • Deviation
- 32 • Corrective action
- 33 • Data reduction and validation
- 34 • Reporting
- 35 • Generation, control, and disposal of records

36 The QA organization will conduct reviews consisting of internal and external assessments to assure that
37 QA/QC procedures are in use and that laboratory staff conform to these procedures. QA reviews will be
38 conducted as deemed appropriate and necessary. Non-conformances will be documented.

39

1 **3.5.2.2 Waste Treatment Plant Sampling QA and QC**

2 Sampling procedures, equipment, and sample preservation and handling requirements are discussed in the
3 QAPjP. Policies and procedures commensurate with the complexity and importance of data will be
4 developed and implemented.

5 Equipment, instrumentation, and supplies at the sampling site will be identified in written procedures that
6 will be developed to accomplish the activities planned. The procedures will typically include the
7 following information:

- 8 • Sampling equipment
- 9 • Sample management
- 10 • Reagent and standard preparation
- 11 • Decontamination equipment
- 12 • Sample collection
- 13 • Field measurements
- 14 • Equipment calibration and maintenance

15 **3.5.3 Selecting Other Analytical Laboratories**

16 The WTP may contract with other Hanford Site laboratories to provide analytical services, as necessary,
17 based on a review of the ability of each laboratory to provide acceptable data for the types of waste
18 handled by the WTP. The review will include an onsite surveillance of the laboratory facilities, and a
19 review of its documentation. Evaluation of candidate laboratories will be based on the following criteria:

- 20 • Licenses or permits issued by the applicable government authority, allowing the laboratory to handle
21 waste samples that contain chemical and radiological components.
- 22 • Laboratory accreditation.
- 23 • Analytical capacity, including number and type of analytical instruments, sample preparation
24 facilities, and sufficient uncommitted capacity, or a commitment to procure sufficient capacity to
25 handle the sample load.
- 26 • Adequate number of qualified technical staff.
- 27 • Demonstrated history of performing acceptable analyses.
- 28 • Adequate sample tracking system (refer to Section 7.2, *Sample Tracking*).
- 29 • A demonstrated QA program that meets the requirements of SW-846, Chapter 1, Section 4.4
30 (EPA 1997a).

31 **3.6 Waste Feed Designation**

32 Waste numbers described in the *Double-Shell Tank System Unit Permit, Operating Group 12, Addendum*
33 *B, Waste Analysis Plan* are applicable to the waste feed. These dangerous waste numbers are listed in
34 Table B1-2.

35 The waste feed will carry the numbers for ignitable (D001) and reactive (D003) waste. However, based
36 on past process knowledge, which includes the age, temperature, history, and chemical composition of the
37 waste feed stored in the DST system unit, it is not expected to exhibit the characteristics of ignitability or
38 reactivity found in WAC 173-303-090. After the waste feed has been received into the WTP, this process
39 knowledge will be used to remove the dangerous waste number for ignitability and reactivity.

40 Precautions taken to prevent accidental ignition or reaction of ignitable or reactive waste will be in
41 accordance with WAC 173-303-395(1)(a) through (d), and will be documented in the WTP operating

1 record in accordance with WAC 173-303-395(1)(c), as discussed in the QAPjP. Tank inspection is
2 addressed in Addendum E-1.

3 **3.6.1 Ignitable Waste**

4 Four properties of a waste found in WAC 173-303-090(5)(a) are used to determine whether a waste
5 exhibits the characteristic of ignitability. These four properties are listed in Table B1-4, and discussed
6 below.

7 WAC 173-303-090(5)(a)(i) states, in part: “It is a liquid, other than an aqueous solution containing less
8 than 24 percent alcohol by volume, and has a flash point less than 60 °C (140 °F).” The *Tank Waste*
9 *Remediation System Final Safety Analysis Report* (DOE-RL 1999), identifies 241-C-103 as the only tank,
10 at this time, that contains a separate organic solvent phase. The flash point of the separate organic solvent
11 phase on Tank 241-C-103 was determined to be 118 °C (Pool and Bean, 1994). This flash point is well
12 above the regulatory threshold of 60 °C for determining the characteristic of ignitability and represents a
13 worst case flash point for the liquid portion of the waste feed. Since the liquid portion of the waste feed is
14 aqueous and contains a maximum of 10 percent total organic carbon, the flash point test will not be
15 performed on the aqueous waste feed.

16 The WAC 173-303-090(5)(a)(ii) property of ignitability pertains to material that is not a liquid. Portions
17 of the tank waste are in a solid (crust and salt cake) and semi-solid (sludge) form. Process knowledge
18 indicates that this property of ignitability does not apply to the tank waste. Throughout the history of the
19 tank farms (Blankenship, 1990), there has been no evidence of the solid or semi-solid portions of the tank
20 waste “causing fire through friction, absorption of moisture or spontaneous chemical changes, and when
21 ignited, burns so vigorously and persistently that it creates a hazard” (WAC 173-303-090(5)(a)(ii)).

22 WAC 173-303-090(5)(a)(iii) pertains to compressed gas. This definition does not apply since the tank
23 farm waste is not a compressed gas.

24 WAC 173-303-090(5)(a)(iv) states: “It is an oxidizer, if it is defined as such in 49 CFR 173.127 and
25 173.128”. According to 49 CFR 173.127 an oxidizer is defined as “a material that may, generally by
26 yielding oxygen, cause or enhance the combustion of other materials.” Nitrate and nitrite salts are present
27 in the waste feed (Blankenship, 1990) and can yield oxygen. However, the *Organic Solvent Topical*
28 *Report* (HNF-4240) determined that the nitrate and nitrite in the DST waste will not cause or enhance the
29 combustion of other materials. Thus, the DST waste does not meet the definition of an oxidizer. The
30 *Organic Solvent Topical Report* (HNF-4240) was independently reviewed and accepted by the Chemical
31 Reactions Subpanel of the Tanks Advisory Panel, the Defense Nuclear Facilities Safety Board staff, and
32 the Oregon Office of Energy (DOE-ORP 2000).

33 49 CFR 173.128 defines organic peroxides and is not applicable to the waste feed.

34 The dangerous waste number D001 for ignitability will be removed from the waste feed after it is
35 received into the WTP, based upon the previous discussions of process knowledge.

36 **3.6.2 Reactive Waste**

37 WAC 173-303-090(7)(a) lists eight properties of a waste that would cause it to be designated as a reactive
38 waste. The eight properties are listed in Table B1-5 and are discussed in the following paragraphs.

39 WAC 173-303-090(7)(a)(i) describes a waste that is unstable and will undergo violent change. The
40 Hanford tank waste has not exhibited a violent change during the history of the tank farms. Differential
41 thermal analysis or differential scanning calorimeter analysis has been performed on the tank waste.
42 These tests have shown that the waste does not react under thermal stress (Blankenship, 1990).

43 WAC 173-303-090(7)(a)(ii), (iii), and (iv) involve waste that, when mixed with water, produces
44 hazardous reactions, or generates toxic gases, vapors, or fumes. Since the tank waste is already a water
45 solution, it does not meet the definitions that: (ii) “It reacts violently with water” (iii) “It forms explosive

1 mixtures with water,” or (iv) “When mixed with water, it generates toxic gases, vapors or fumes in a
2 quantity sufficient to present a danger to human health or the environment.”

3 Hydrogen, ammonia, oxides of nitrogen, and methane are generated in the Hanford waste tanks. These
4 gases are generated primarily from the radiolytic decomposition of the waste and are not a result of
5 mixing with water (Johnson, 1996). Nevertheless, flammable gases produced by the radiolytic
6 decomposition of the waste, and to a lesser degree, thermolytic decomposition, will be managed at the
7 WTP through ventilation of the vessels that contain the waste feed.

8 WAC 173-303-090(7)(a)(v) concerns the generation of toxic gases, vapors, or fumes when a Cyanide- or
9 Sulfide-bearing waste is exposed to pH conditions between 2 and 12.5, in a quantity sufficient to present a
10 danger to human health or the environment. Hydrogen Cyanide and Hydrogen Sulfide are the gases that
11 would be generated from Cyanide- or Sulfide-bearing waste when exposed to acidic conditions. In 1985,
12 the EPA published guidance for determining regulated thresholds for these gases as 250 milligrams per
13 kilogram of waste for Hydrogen Cyanide and 500 milligrams per kilogram of waste for Hydrogen Sulfide.
14 Although these numerical thresholds were rescinded by the EPA (EPA 1998), they are still useful as
15 benchmarks for determining the characteristic of reactivity and are still accepted by Ecology.

16 Thirteen tanks have been investigated by the Pacific Northwest National Laboratory under CH2M Hill
17 Hanford Group, Inc., Project Number 41503, for their potential to generate these gases at pH between 2
18 and 12.5. Included in these thirteen tanks are the tanks scheduled for vitrification during the first ten
19 years of WTP operation. This report researched the analytical data for the concentrations of Cyanide and
20 Sulfide in the supernatant and solids in the tanks, using the best basis inventory on the Tank Waste
21 Information Network System database current to November 2000 (LMHC 1999). Analytical data for
22 Cyanide was available, but no data was available for Sulfide since there is no history of Sulfide addition
23 to the tank farms. Consequently, the author used total Sulfur and Sulfate concentration values for the
24 evaluation. Standard chemistry principles were used to calculate the potential generation of Hydrogen
25 Cyanide and Hydrogen Sulfide in acidic conditions. This investigation determined that Hydrogen
26 Cyanide and Hydrogen Sulfide would not be generated at the respective benchmark levels of 250 and 500
27 milligrams per kilogram of waste for these tanks. Thus the waste feed contained in tanks scheduled for
28 the first ten years of WTP operation is not considered to be Sulfide- or Cyanide-bearing waste.

29 WAC 173-303-090(7)(a)(vi), (vii), and (viii) is concerned with waste that will detonate or explode.
30 Process knowledge and history indicate that the tank waste does not detonate or explode. As mentioned
31 previously, differential thermal analysis or differential scanning calorimeter analysis has been performed
32 on the tank waste, showing that it does not react under thermal stress (Blankenship, 1990). Finally, the
33 tank farm waste is not regulated as an explosive in 49 CFR 173.50.

34 The WTP will remove the dangerous waste number D003 for reactivity from the waste feed based upon
35 the above process knowledge.

36 **4.0 WASTE CHARACTERIZATION**

37 Prior to the transfer of DST waste feed, the WTP will characterize the waste feed in conformance with the
38 RDQO Optimization (24590-WTP-RPT-MGT-04-001). After the the set of analytes are determined and
39 methods are developed and approved by Ecology, the waste feed will be analyzed and the results used to
40 characterize the waste. The data quality objective process is an ongoing activity and may periodically
41 affect the set of analytes and analytical methods.

42 **4.1 Sampling Methods and Sampling Frequency**

43 The samples collected for characterization of the DST waste feed staged for transfer to the WTP will be
44 collected as described in Section 9.2 of the RDQO Optimization (24590-WTP-RPT-MGT-04-001). One
45 sample will be collected from the DST waste feed tank for characterization of the waste stored in that tank

1 **4.2 Sample Preservation, Storage, and Holding Times**

2 Sample preservation, storage, and holding times for the samples collect to support characterization of the
3 DST waste feed are discussed in Section 9.7 of the RDQO Optimization (24590-WTP-RPT-MGT-04-
4 001).

5 **4.3 Selection of Analytes**

6 The analytes for characterization of the DST waste feed have been determined as a result of the RDQO
7 Optimization (24590-WTP-RPT-MGT-04-001) process and will be re-evaluated as a result of the
8 environmental risk assessment, currently under development. These activities are scheduled to be
9 completed prior to the commencement of cold operations, and will be used to establish a set of analytes
10 appropriate to perform characterization of the DST waste feed.

11 **4.4 Selection of Analytical Methods**

12 Identification of analytical methods that will be used to obtain the necessary data for characterizing the
13 DST waste feed is addressed in Section 9.8.3 of the RDQO Optimization (24590-WTP-RPT-MGT-04-
14 001). Modified SW-846 (EPA 1997a) methods, except for sample size or as otherwise identified in the
15 RDQO Optimization (24590-WTP-RPT-MGT-04-001), will not be used for characterization until they are
16 authorized by Ecology.

17 **4.5 Quality Assurance and Quality Control**

18 Quality assurance and quality control for DST waste feed characterization are addressed in Sections 9.6
19 and 9.8.5 of the RDQO Optimization (24590-WTP-RPT-MGT-04-001) report.

20 **5.0 WASTE STREAMS**

21 In addition to the vitrified glass product, the pretreatment processes and the LAW and HLW vitrification
22 processes will generate a variety of solid, liquid, and gaseous waste streams. Some of these waste streams
23 include waste derived from the incoming feed from the DST system unit. Other wastes include spent
24 materials used in processing the waste feed, such as rinsate and scrubber solutions that come into contact
25 with the waste feed or its derivatives, and contaminated equipment. General facility operations and
26 maintenance activities will also generate dangerous waste.

27 Waste streams regulated under WAC 173-303 (because of dangerous waste concerns) include the ILAW
28 and IHLW, as well as miscellaneous secondary solid and liquid waste streams. Air emissions subject to
29 regulation, commonly referred to as Subparts AA, BB, and CC, are discussed in Section 2.3.4. Other
30 regulated air emissions are addressed under the permit applications to be developed under the Clean Air
31 Act of 1990 (CAA 1990) and the Washington Clean Air Act of 1967 (WCAA 1967), and are not included
32 in the following discussions.

33 Section 5.1 describes the land disposal restriction (LDR) evaluation for the immobilized waste streams.
34 Section 5.2 describes the secondary waste streams generated by the WTP, including characterization of
35 secondary waste, the associated sampling and analysis activities, and the ultimate treatment, storage, or
36 disposal of regulated waste.

37 **5.1 Land Disposal Restrictions Evaluation for Immobilized Waste**

38 This section describes the approach for addressing the LDR program requirements applicable to the land
39 disposal of ILAW and IHLW.

40 **5.1.1 Land Disposal Restrictions Treatment Standards**

41 Land disposal restrictions are codified in WAC 173-303-140, which incorporates 40 CFR Part 268 by
42 reference. 40 CFR 268.40 identifies the treatment standards for the land disposal of a dangerous waste. It
43 states:

1 “(a) A waste identified in the table “Treatment Standards for Hazardous Wastes” may be land
2 disposed only if it meets the requirements found in the table. For each waste, the table
3 identifies one of three types of treatment standard requirements:

4 (1) All hazardous constituents in the waste or in the treatment residue must be at or below the
5 values found in the table for that waste (“total waste standards”); or

6 (2) The hazardous constituents in the extract of the waste or in the extract of the treatment
7 residue must be at or below the values found in the table (“waste extract standards”); or

8 (3) The waste must be treated using the technology specified in the table (“technology
9 standard”), which are described in detail in § 268.42, Table 1 – Technology Codes and
10 Description of Technology-Based Standards.”

11 The “total waste standards” and “waste extract standards” require repeated sampling and analysis of the
12 waste to demonstrate that the dangerous constituents in the waste are at or below the values found in the
13 table. These standards are appropriate for a limited dangerous waste stream, but are not a good choice for
14 a mixed waste stream of extended duration because of repeated human exposure during sampling and
15 analysis.

16 *Table 1 – Technology Codes and Description of Technology-Based Standards* (40 CFR 268.42) includes
17 the technology standard HLVIT. At the request of DOE, the HLVIT treatment technology was
18 promulgated by the EPA to treat the tank wastes at the Savannah River Site. According to the *Treatment*
19 *Standards for Hazardous Wastes* table (40 CFR 268.40), HLVIT is the technology for the treatment of the
20 following dangerous waste numbers from radioactive high-level wastes generated during the reprocessing
21 of fuel rods:

22	D002	Corrosivity (pH)
23	D004	Arsenic
24	D005	Barium
25	D006	Cadmium
26	D007	Chromium (total)
27	D008	Lead
28	D009	Mercury
29	D010	Selenium
30	D011	Silver

31 **5.1.2 Treatment Standard for the Hanford Tank Waste**

32 Similar to the treatment of the Savannah River Site tank waste, the treatment of the Hanford tank waste
33 will require many years of WTP operation. Rather than repeated sampling and analysis of the waste to
34 demonstrate LDR using the total waste standard or the waste extract standard, it would be appropriate to
35 treat the Hanford tank waste to a specific treatment standard, such as the HLVIT treatment standard
36 described above for the Savannah River Site tank waste. Consequently, the WTP will submit a land
37 disposal restriction treatability variance petition to the EPA and Ecology to establish a new treatment
38 standard that will be specific to the Hanford tank waste. The new treatment standard would specify
39 vitrification as the land disposal treatment standard for Hanford double-shell and single-shell tank waste
40 for the characteristic and listed waste numbers applicable to the Hanford tank waste.

41 As required by 40 CFR 268.44, *Variance from a treatment standard*, the petition will be submitted in
42 accordance with the procedures specified in 40 CFR 260.20. The negotiated petition would be published
43 in the Federal Register for public comment. After successful resolution of public comments, the EPA
44 would promulgate a final rule establishing the treatment standard. The Hanford tank waste would then
45 meet LDR through treatment by the promulgated treatment standard.

1 **5.2 Secondary Waste Streams**

2 The WTP's primary mission is to vitrify the Hanford tank waste. This process will also generate a variety
3 of secondary waste streams that must be properly managed. The management of secondary waste streams
4 that will be regulated as dangerous waste is discussed in this section.

5 Secondary waste streams that will be transferred back to the DST system unit will be designated with
6 waste numbers based upon process knowledge. Waste transferred to the DST system unit will meet the
7 DST waste acceptance criteria.

8 Secondary waste streams are divided into solid waste streams (discussed in Section 5.2.1) and liquid
9 waste streams (discussed in Section 5.2.2). Dangerous waste streams generated within the WTP will meet
10 the waste acceptance criteria or protocols established by the receiving TSD facilities' permits and
11 operating authority. This document does not outline the details of sampling and analyzing each waste
12 stream because each TSD receiving waste may update its waste acceptance criteria and thus alter the
13 required waste analyses.

14 The following general information related to waste classification applies to solid and liquid secondary
15 waste streams:

- 16 • Normally, waste streams will be designated using process knowledge. Acceptable process knowledge
17 includes:
 - 18 – Historical analytical data.
 - 19 – Mass balance from a controlled process with a specified output for a specified input.
 - 20 – Material safety data sheets.
 - 21 – Analytical data on the waste from a similar process.
 - 22 – For mixed waste, process knowledge could include information from surrogate material.
- 23 • The listed waste numbers F001 through F005 will follow the secondary waste if the secondary waste
24 is derived from the waste feed. F039 waste was never placed in the DST system unit, and will not be
25 applied to secondary waste. If the DST system unit receives F039 waste in the future, then F039 will
26 be applied to secondary waste that contacts the DST waste feed.
- 27 • Secondary wastes that are not derived from the waste feed, such as laboratory and maintenance waste,
28 will be characterized and designated with the appropriate EPA hazardous waste numbers and
29 Washington State dangerous waste numbers, and managed accordingly.
- 30 • If analyses are required for determining waste numbers for a secondary waste, laboratory procedures
31 will be prepared using applicable SW-846 (EPA 1997a) methods. Analytical procedures will be
32 revised, as appropriate, if SW-846 (EPA 1997a) methods are revised.
- 33 • Documentation of the process knowledge or analytical data used to designate the waste numbers will
34 be maintained in the WTP operating record. Documentation is discussed in Section 6 of this report,
35 and waste tracking is presented in Section 7.
- 36 • Characteristic of ignitability (D001) and reactivity (D003) waste numbers can be removed after
37 testing or the application of process knowledge, as appropriate.

38 **5.2.1 Solid Waste Streams**

39 Solid waste streams that are designated as dangerous or mixed waste will be transferred to Hanford Site
40 TSDs in accordance with the current *Hanford Site Solid Waste Acceptance Criteria* (HSSWAC)
41 (HNF 2001). The WTP will meet the unit specific waste acceptance criteria for the receiving Hanford

1 Site or other appropriate TSD. Solid wastes that are stored at the WTP will meet the acceptance criteria
2 of the specific WTP storage area.

3 **5.2.1.1 Solid Waste Designated as Mixed Waste**

4 Solid waste streams that will come into contact with the waste feed during any stage of the treatment
5 processes will be designated as mixed waste by process knowledge. These secondary waste streams are
6 listed in Table B1-6. EPA hazardous waste numbers and Washington State dangerous waste numbers
7 will be assigned to these mixed waste streams, based on the characterization of the waste feed. Each
8 waste stream discussed below will meet the waste acceptance criteria of the receiving facility. A
9 discussion of each of these mixed waste streams is provided.

10 Out-of-Service Melters

11 It is anticipated that melters will require replacement at some point, due to the harsh conditions of the
12 vitrification process. When the end of a melter's operational life is reached, residual molten glass will be
13 removed as immobilized product, as much as is practical. The melter will be allowed to cool and then
14 will be disconnected.

15 The locally shielded melter (LSM) will be a disposal container or overpack, defined as a Resource
16 Conservation and Recovery Act (RCRA 1976) miscellaneous unit, containing the LAW melter. The
17 LSM, including residual glass, will be the final disposal container. After disconnection, the openings will
18 be closed to provide complete containment. The LAW LSM will be transported to a permitted Hanford
19 TSD. Refer to Addendum C for a more complete description of the LSM.

20 A HLW melter that is removed from service and that meets the HSSWAC will be placed into an overpack
21 that will serve as its disposal container. The HLW disposal container is not a LSM. The overpacked
22 HLW melter will be transported to a permitted Hanford Site TSD for disposal.

23 An out-of-service HLW melter may not meet the HSSWAC, depending on its radionuclide content. If
24 this should occur, the overpacked HLW melter will be stored at the WTP or another permitted storage
25 facility until facility closure, at which time it will be dismantled, packaged, and transported to a permitted
26 Hanford Site TSD for disposal.

27 The details for the disposal of the LAW LSM and overpacked HLW melters are currently under
28 development.

29 HLW Glass Residue

30 The disposal path for HLW glass residue that may be removed from an out-of-service HLW melter will
31 be determined case-by-case. Final disposal will be based on the radionuclide content and dangerous
32 characteristics of the glass residue.

33 Melter Components

34 Melters will be fitted with various ancillary equipment (bubbler assemblies, heating elements, and
35 thermocouples) that may require periodic replacement. The ancillary equipment will be removed,
36 designated by process knowledge as mixed waste, and packaged and transferred to an appropriate TSD.

37 Off-gas Treatment System Components

38 HEMEs, HEPA filters, and silver mordenite canisters will be components of the off-gas treatment system
39 incorporated to remove contaminants from the off-gas streams prior to discharge. These components will
40 periodically be replaced to maintain treatment efficiency. They will be designated by process knowledge,
41 packaged, and transferred to an appropriate TSD.

1 Spent Carbon and Catalyst from Off-gas Treatment

2 Spent carbon and catalyst from off-gas treatment will periodically be replaced to maintain treatment
3 efficiency. These materials will be designated by process knowledge and managed as mixed waste. They
4 will be removed from their respective equipment, packaged, and transferred to an appropriate TSD.

5 Spent Ion Exchange Resins

6 Ion exchange resins used for cesium removal will periodically be replaced to maintain treatment
7 efficiency. These resins will be designated by process knowledge and managed as mixed waste. They
8 will be eluted, removed from their respective columns, packaged, and transferred to an appropriate TSD.

9 Spent Ultrafilters

10 Ultrafilters may be periodically replaced to maintain treatment efficiency. They will be designated as
11 mixed waste by process knowledge, packaged, and transferred to an appropriate TSD.

12 Out-of-Service Equipment

13 Ancillary equipment, such as pumps, valves, piping, motors, and electrical equipment that is no longer fit
14 for use will be removed from service and designated as out-of-service equipment. Out-of-service
15 equipment that contacted the waste feed or secondary waste liquid streams will be designated by process
16 knowledge, packaged and transferred to an appropriate TSD.

17 Entrained Solids

18 Entrained solids will be generated by pretreating the LAW feed using ultrafiltration. The separated solids
19 will be washed and again concentrated using ultrafiltration. The entrained solids will be incorporated into
20 the HLW feed.

21 **5.2.1.2 Variable Waste Streams**

22 The waste streams listed in Table B1-7 can be dangerous waste or mixed waste, depending on the source
23 of the waste and whether it had contact with the waste feed. EPA hazardous waste numbers and
24 Washington State dangerous waste numbers will be assigned to these waste streams, based on the
25 designation of the waste by process knowledge. In addition to the waste streams listed in Table B1-7,
26 raw process materials and chemicals will be brought onto the WTP site. Some of these substances may
27 subsequently become waste and will require characterization for proper waste management. The material
28 safety data sheet (MSDS) provides the information necessary to properly characterize and designate a
29 substance when it becomes a waste. Vendors will be required to provide MSDS for substances that will
30 be brought onto the WTP site, and a MSDS file will be maintained by the WTP. Examples of these types
31 of substances are process and laboratory chemicals, lubricants such as oils and greases, and maintenance
32 products, such as paints, solvents, and adhesives.

33 Subcontractors to the WTP will be required to have an MSDS for the substances that they bring onto the
34 WTP site. Subcontractors will also be required to remove the residuals of any substance that they bring
35 onto the WTP site, including wastes generated such as wipes, paintbrushes, and personal protective
36 equipment. Subcontractors may make arrangements with another waste management organization to
37 manage the generated wastes.

38 Laboratory Waste

39 Liquid laboratory waste collected in the hot cell drain and lab area sink drain collection vessels will be
40 transferred to the pretreatment facility for recycle. Non-wastewater laboratory waste derived from the
41 waste feed will be designated as mixed waste by process knowledge, packaged, and transferred to an
42 appropriate TSD. Other non-wastewater laboratory wastes, such as off-specification laboratory
43 chemicals, will be designated by process knowledge and managed accordingly. These wastes will be
44 packaged and treated as necessary and disposed of at an appropriate TSD.

1 Personal Protective Equipment

2 Personnel performing certain tasks such as facility maintenance, treatment process operations, and waste
3 packaging activities, may wear personal protective equipment. Used personal protective equipment may
4 be returned to the vendor for cleaning and refurbishment. Used personal protective equipment that cannot
5 be recycled to the vendor and has had contact with waste feed will be designated as mixed waste by
6 process knowledge, packaged, and transferred to an appropriate TSD. Personal protective
7 equipment waste that is not radioactive but is designated as dangerous waste by process knowledge will
8 be packaged as necessary and disposed of at an appropriate TSD.

9 Maintenance Waste

10 Maintenance wastes such as paints, lubricants, cleaning solvents, adhesives, and off-specification
11 chemicals will be generated at the WTP. Maintenance wastes derived from the waste feed will be
12 designated as mixed waste by process knowledge, packaged, and transferred to an appropriate TSD.
13 Those not derived from the waste feed and designated as dangerous waste by process knowledge will be
14 packaged as necessary and disposed of at an appropriate TSD.

15 **5.2.2 Liquid Waste Streams**

16 The dangerous liquid waste streams generated at the WTP will be managed in accordance with the
17 *Hanford Site Liquid Waste Acceptance Criteria* (HSLWAC) (WMFS 1998). The LERF or the ETF, or
18 both, will receive hazardous aqueous waste generated at WTP. The waste will meet the acceptance
19 criteria as outlined in the HSLWAC. The LERF and ETF allow process knowledge to be used in lieu of
20 some analyses in instances where process knowledge is adequate, and a LERF or ETF representative will
21 work with a WTP representative to identify the waste acceptance criteria and analyses appropriate for
22 liquid waste characterization.

23 The liquid waste streams listed in Table B1-8 will be collected in an effluent collection tank. Should
24 sampling be required, the sample will be drawn from a location identified in Figure B1-1 as S3. Samples
25 will be taken from the effluent collection tank by a computer-controlled auto-sampling system. Auto-
26 sampling of waste streams is described in Section 7.2.1 of the American Society for Testing and Materials
27 (ASTM) Designation D6232-98, *Standard Guide for Selection of Sampling Equipment for Waste and*
28 *Contaminated Media Data Collection Activities* (ASTM 1998). The effluent collection tank will be
29 stirred during sample collection to provide representative samples.

30 Disposable sampling equipment will eliminate the need for equipment decontamination after use. If the
31 use of disposable equipment is not practical, the sampling equipment will be decontaminated before and
32 following each sample event.

33 A discussion of each aqueous waste stream is presented below.

34 Aqueous Waste from Processes

35 Table B1-8 lists the aqueous waste streams that will be generated by the WTP from processing the DST
36 waste feed. The analytical laboratory will also generate aqueous waste. These waste streams will contain
37 both radioactive and dangerous waste components and will be similar to the process condensate stream
38 described in the *Hanford Facility Dangerous Waste Permit Application, 242-A Evaporator*
39 (DOE-RL 2005). These aqueous waste streams will be piped to the effluent collection tank prior to
40 transfer to the LERF/ETF by underground pipeline for treatment.

1 Plant Wastewater

2 Wastewater will be generated primarily from decontamination and wash-down activities in the WTP. The
3 wastewater will be designated as mixed waste by process knowledge, since it will contain dilute waste
4 feed constituents. Wastewater will also be piped to the effluent collection tank prior to transfer to the
5 LERF/ETF by underground pipeline for treatment.

6 **6.0 WASTE TRANSFER DOCUMENTATION SYSTEM**

7 **6.1 Solid Waste Transfer**

8 The WTP is part of the Hanford Site facility because it will operate under the same EPA identification
9 number as the other Hanford Site facilities. The WTP will prepare transportation documentation for the
10 transfer of dangerous or mixed waste to a Hanford TSD according to the requirements of Condition II.N
11 of the draft *Hanford Facility Dangerous Waste Permit* (Ecology 2011). Condition II.N.2.d exempts
12 waste that will be transported by rail or pipeline unless required by unit-specific conditions. This
13 exemption will apply to waste feed that is transferred to and from the WTP by underground pipeline, and
14 to effluent transferred to the LERF/ETF by underground pipeline.

15 Waste transfer documentation and supporting process knowledge will be considered QA records and
16 managed in accordance with the requirements for document control, as outlined in the QAPjP. This
17 documentation will specify the identity of the receiver and confirm that the receiver accepted the waste.
18 WTP staff and the waste receiver's acceptance personnel will date and sign the waste transfer papers.
19 Electronic waste transfer documentation may be used, as appropriate.

20 Solid and liquid waste transfers and LDR notifications are discussed in the following sections.

21 The WTP, as a waste generator, will provide documentation with each shipment of regulated solid waste
22 to a Hanford Site TSD in accordance with the current HSSWAC (HNF 2001). Regulated solid waste
23 transferred from the WTP to a Hanford Site TSD will meet the unit-specific waste acceptance criteria for
24 the receiving TSD. Regulated waste shipped to an offsite TSD will be accompanied by a manifest,
25 according to WAC 173-303-180.

26 **6.2 Liquid Waste Transfer**

27 Aqueous waste transfers from the WTP to the 200 Area LERF/ETF will comply with the current
28 HSLWAC (WMFS 1998). A waste profile sheet will accompany aqueous waste transfers.

29 **6.3 Land Disposal Restrictions Notification and Certification**

30 WTP will provide LDR notification and certification of WTP shipped waste that contain LDR
31 constituents above the treatment standards listed in 40 CFR 268.40. The information will be included
32 with transfer documents to the receiving TSD facility for solid waste and liquid waste transfers.

33 **7.0 TRACKING SYSTEM**

34 The plant information network (PIN) system is designed to collect and maintain information. The PIN
35 enables WTP operational and support activities. In addition, it provides data on the glass product,
36 secondary wastes, and monitoring activities. The PIN consists of software applications designed to meet
37 specific requirements and functions. An overview of the network software systems is provided in Figure
38 B1-2.

39 The PIN will consist of the following:

- 40 • Computerized Maintenance Management System (CMMS).
41 • Plant Data Warehouse and Reporting System (PDWRS).
42 • Laboratory Information Management System (LIJ).
43 • Waste tracking and inventory system (to be developed).

1 The PIN will interface with the integrated control network (ICN). The ICN will consist of the process
2 control system, mechanical handling control system, and the auto-sampling control system.

3 These systems will be discussed in the following sections as they relate to waste tracking

4 **7.1 Inventory and Batch Tracking**

5 The waste tracking and inventory system serves as the main repository for the relevant information
6 pertinent to a given waste batch. Data is collected for each sequence or step throughout the processing
7 history of a given batch of waste, from receipt of raw feed to disposition of the finished products,
8 including secondary waste. At the end of a batch cycle, the data applicable to that particular batch will be
9 catalogued to facilitate historical recording and reporting.

10 The waste tracking and inventory system will also record the inventory of glass product containers,
11 including the data generated for each container of vitrified waste, and including the final QA checks.
12 Each glass product container will bear a unique identification number to facilitate tracking.

13 **7.2 Sample Tracking**

14 Sampling activities will be started, monitored, and controlled through the plant ICN, with key sequence
15 durations and operations logged. These requests will be time and date stamped, as will the actual
16 sampling operation and the associated sample handling and laboratory activities.

17 The LIMS will be an integral feature of the PIN. Workstations will be located within the laboratory and
18 the plant control rooms. The required quality control checks to assure correct sample preparation and
19 selection of analyses will be recorded in the LIMS.

20 Sample containers received in the laboratory preparation area will be identified by their identification (ID)
21 label. The ID label correlates the sample container with the sample source and, therefore, identifies the
22 required preparation and analysis techniques. The ID will be registered at the locations where manual
23 intervention is required, such as manual samplers. The results of calibration checks on equipment and
24 analyzers will be recorded.

25 Analytical results will be compiled by the LIMS and held, pending checking and approval by laboratory
26 staff, before being formally recorded within the waste tracking and inventory system. Process control
27 sample results will be communicated to appropriate plant personnel.

28 Samples transferred to an analytical laboratory external to the WTP will be tracked in the LIMS. The
29 LIMS will be capable of accurately tracking samples through the laboratory, and accurately recording
30 analytical results and quality control data. Section 3.5.3 discusses the evaluation of external analytical
31 laboratories.

32 **7.3 Secondary Waste Stream Tracking**

33 Secondary waste streams will be tracked within the waste tracking and inventory system in a manner
34 similar to that of primary waste streams. Secondary waste streams will be managed by using assigned,
35 unique ID numbers. Corresponding histories and data collection triggers will gather process and status
36 information during the processing of secondary waste in order to satisfy tracking of waste disposal
37 records. Shipments of overpacks will be labeled and tracked as part of the inventory control function of
38 the waste tracking and inventory system.

39 Maintenance, decommissioning, or disposal activities may generate consumables, including such items as
40 equipment, hardware, personal protective equipment, and materials used in the normal operation of the
41 facility. Consumables that are designated as dangerous waste will be tracked by the waste tracking and
42 inventory system, with appropriate fields denoting the hazardous classification of the disposed parts and
43 materials, and cross-linked to disposal records. Waste being accumulated in satellite accumulation areas
44 under the provisions of WAC 173-303-200 will also be tracked.

1 **8.0 RECORD KEEPING**

2 Records generated for environmental compliance will be legible, identifiable, and retrievable, and will be
3 protected against damage, deterioration, or loss. Requirements and responsibilities for record
4 transmission, distribution, retention, maintenance, and disposal will be established and documented. The
5 requirements contained in (a), (b), and (c) of WAC 173-303-380 “Facility Recordkeeping” are addressed
6 in this WAP and will be managed through the waste tracking system record keeping policies. Additional
7 requirements listed under WAC 173-303-380 are addressed in the QAPjP. Records generated to support
8 activities described in the WAP will be considered QA records. These may be in electronic or hardcopy
9 format, and will be managed according to the requirements outlined in the QAPjP.

10 The following documents that support this WAP are considered QA records:

- 11 • Sample information provided by the DST system unit, including constituents of concern from
12 sampling activities, laboratory analysis results, waste certifications, shipping and transfer papers.
- 13 • Verification analytical data.
- 14 • Documentation used for any discrepancy resolution and non-conformance action.
- 15 • Confirmation volume measurement data, including any discrepancy resolution.
- 16 • Documentation used for LDR evaluation.
- 17 • Sampling and analytical data developed for meeting the waste acceptance criteria of receiving
18 facilities.
- 19 • Calibration data from analytical equipment.
- 20 • Shipment and waste transfer documentation, including waste profile sheets, and LDR information
21 forms.

22 **9.0 REFERENCES**

23 **9.1 Project Documents**

24 *Waste Treatment and Immobilization Plant Dangerous Waste Permit Application*, as amended.

25 *Waste Treatment Plant Quality Assurance Project Plan for the Waste Analysis Plan, Rev. 0.*

26 24590-WTP-RPT-MGT-04-001, Rev. 0, *Regulatory Data Quality Objectives Optimization Report*

27 RPT-W375LV-EN00002, as amended. *Approach to Immobilized Hanford Tank Waste Land Disposal*
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29 **9.2 Codes and Standards**

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33 40 CFR 261. *Identification and Listing*, Code of Federal Regulations, as amended.

34 40 CFR 264. *Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and*
35 *Disposal Facilities*, Code of Federal Regulations, as amended.

36 40 CFR 268. *Land Disposal Restrictions*, Code of Federal Regulations, as amended.

37 40 CFR 761.61. *PCB Remediation Waste*, Code of Federal Regulations, as amended.

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Table B1-1 Summary of the Waste Feed Acceptance Process

Section Reference	Action
3.2.1	The DST system unit submits a waste profile.
3.2.2	The DST system unit submits a split sample aliquot of the waste feed to WTP for waste verification analyses, if requested. The verification analysis process is discussed in Section 3.3.
3.2.3	Qualified WTP personnel perform a pre-shipment review by examining the waste profile and the verification analytical results to ensure compatibility and acceptability of the waste feed. If the review finds that the waste feed is acceptable, the WTP notifies the DST system unit that the waste feed can be transferred. If the review finds that the waste feed is not acceptable, non-conformance actions are initiated.
3.2.4	Non-conformance actions include a second review of the data and information and may include a second analysis of the verification split sample aliquot. If the waste feed continues to be outside of the waste acceptance criteria, the waste will be refused for transfer.
3.2.5	Acceptable waste feed is transferred from the DST system unit to the WTP.
3.2.6	After waste feed is received into the WTP, the DST system unit and the WTP perform confirmation volume measurements to ensure that the waste feed transferred is the waste feed that was accepted for transfer.

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Table B1-2 Summary of Dangerous Waste Numbers for WTP

Characteristic Waste Numbers				Listed Waste Numbers		
D001	D002	D003	D004	F001	F002	F003
D005	D006	D007	D008	F004	F005	F039 ^a
D009	D010	D011	D018			
D019	D022	D028	D029			
D030	D033	D034	D035			
D036	D038	D039	D040			
D041	D043	WT01 ^b	WT02 ^b			
WP01 ^b	WP02 ^b					
<p>a Multi-source leachate (F039) is included as a waste derived from non-specific source wastes F001 through F005.</p> <p>b Washington State criteria</p>						

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Table B1-3 Waste Feed Analysis, Waste Acceptance Criteria, and Non-Conformance Actions

Parameter	Analytical Method^a	Estimated Sample Volume^b	Required Detection Limit^d	Acceptance Criteria	Non-Conformance Actions
Total organic carbon using persulfate oxidation method	SW-846, Method 9060 or EPA Method 415.2 ^c	1 mL liquid or 0.1 g solid	1 % by weight	TOC < 10 % by weight	Reject waste feed
PCBs	SW-846, Method 8082	10 to 20 mL liquid or 0.5 g solid	5 ppm ^e	PCBs < 50 ppm ^e	Reject waste feed
pH	pH Meter, SW-846, Method 9040	5 mL	1 pH unit	Acceptable pH range >7	Corrective actions to correct pH
Compatibility	ASTM ^d Method D5058-90	10 mL of each waste stream	Temperature Change = 1 °C	Acceptable temperature change < ± 20 °C No viscosity change adversely affecting waste processing	Corrective actions to eliminate incompatible conditions

a SW-846 Method (EPA 1997a) unless specified otherwise.

b Sample volume needed for each analysis.

c EPA Method 415.2 (EPA 1997b).

d American Society for Testing and Materials (ASTM 2001).

e Parts per million = milligrams per liter or milligrams per kilogram (approximate).

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Table B1-4 Properties for the Determination of Ignitable Waste

Regulatory Citation	Ignitable (D001) Waste Property
WAC 173-303-090 (5)(a)(i)	It is a liquid, other than an aqueous solution containing less than 24 % alcohol by volume, and has a flash point less than 60 °C (140 °F), as determined by a Pensky-Martin Closed Cup Tester, using the test method specified in ASTM Standard D-93-79 or D-93-80, or a Setaflash Closed Cup Tester, using the test method in ASTM Standard D-3278-78.
WAC 173-303-090 (5)(a)(ii)	It is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture, or spontaneous chemical changes, and when ignited, it burns so vigorously and persistently that it creates a hazard.
WAC 173-303-090 (5)(a)(iii)	It is an ignitable compressed gas that is defined in 49 CFR 173.115 and is determined to be flammable by the test methods described in that regulation.
WAC 173-303-090 (5)(a)(iv)	It is an oxidizer, if it is defined as such in 49 CFR 173.127 and 173.128.

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Table B1-5 Properties for the Determination of Reactive Waste

Regulatory Citation	Reactive (D003) Waste Property
WAC 173-303-090 (7)(a)(i)	It is normally unstable and readily undergoes violent change without detonating.
WAC 173-303-090 (7)(a)(ii)	It reacts violently to water.
WAC 173-303-090 (7)(a)(iii)	It forms potentially explosive mixtures with water.
WAC 173-303-090 (7)(a)(iv)	When mixed with water, it generates toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment.
WAC 173-303-090 (7)(a)(v)	It is a cyanide- or sulfide-bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment.
WAC 173-303-090 (7)(a)(vi)	It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.
WAC 173-303-090 (7)(a)(vii)	It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.
WAC 173-303-090 (7)(a)(viii)	It is a forbidden explosive as defined in 49 CFR 173.54, or a Class 1 explosive, Division 1.1, Division 1.2, Division 1.3, and Division 1.5, as defined in 49 CFR 173.50.

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Table B1-6 Secondary Solid Mixed Waste Streams

Waste Stream	Characterization	Disposal
Out-of-service melters	Designated by process knowledge	a
HLW glass residue		Determined case-by-case
Melter components		These wastes will be packaged and transferred to the appropriate Hanford TSD.
Off-gas treatment system components: High-efficiency mist eliminators HEPA filters Silver mordenite canisters		
Spent carbon and catalyst from off-gas treatment		
Spent ion exchange resins		
Spent ultrafilters		
Out-of-service equipment		
Entrained solids		

a Disposal of out-of-service melters is currently under development.

b Entrained solids will be added to the HLW feed for vitrification.

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Table B1-7 Variable Solid Waste Streams

Waste Stream	Characterization	Disposal
Non-wastewater laboratory waste	Each generation event of these wastes will be individually designated by process knowledge and will comply with the receiving TSD waste acceptance criteria	The wastes will be packaged and transferred for disposal to an appropriate TSD
Personal protective equipment		
Maintenance waste		

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Table B1-8 Liquid Mixed Waste Streams

Waste Stream	Characterization and Disposal	Sampling Point	Sampling Frequency
Waste feed evaporator condensate	The waste streams will collect in a mixer tank, be designated as mixed waste by process knowledge and analysis, as necessary, and will be transferred to the LERF or ETF.	The streams collected in a mixer tank are grab sampled by autosampler.	Sampling will be: <ul style="list-style-type: none"> • before initial discharge • at major process change • at request for re-sampling by the ETF
LAW melter feed evaporator condensate			
Pretreatment, LAW, and HLW off-gas condensate			
LAW and HLW melter off-gas scrubber blowdown			
Cesium process condensate			
Cesium ion exchange rinse water			
Laboratory wastewater			
Plant wastewater containing waste feed			

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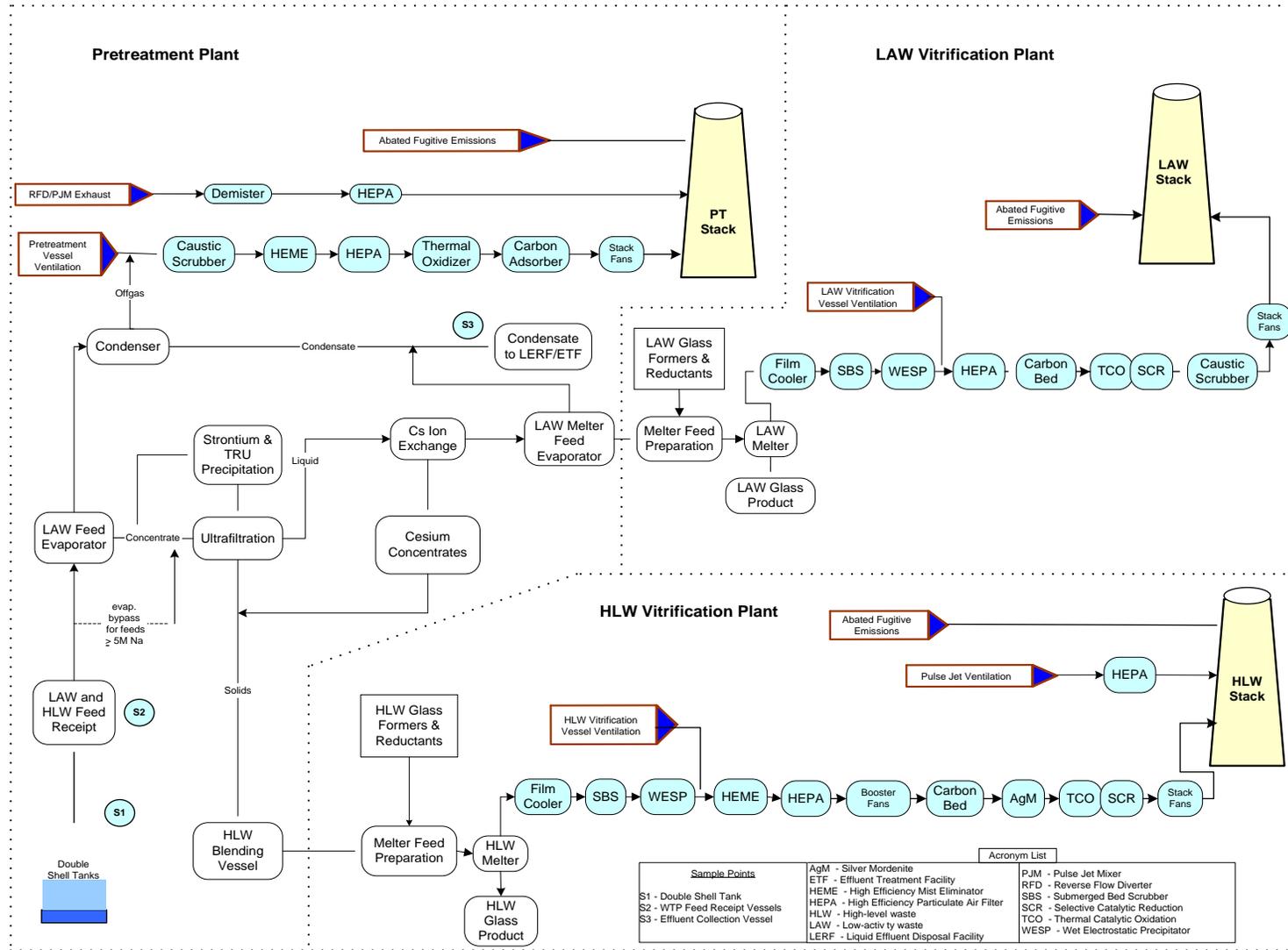
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Figure B1-1 Simplified Flow Diagram and Sampling Locations



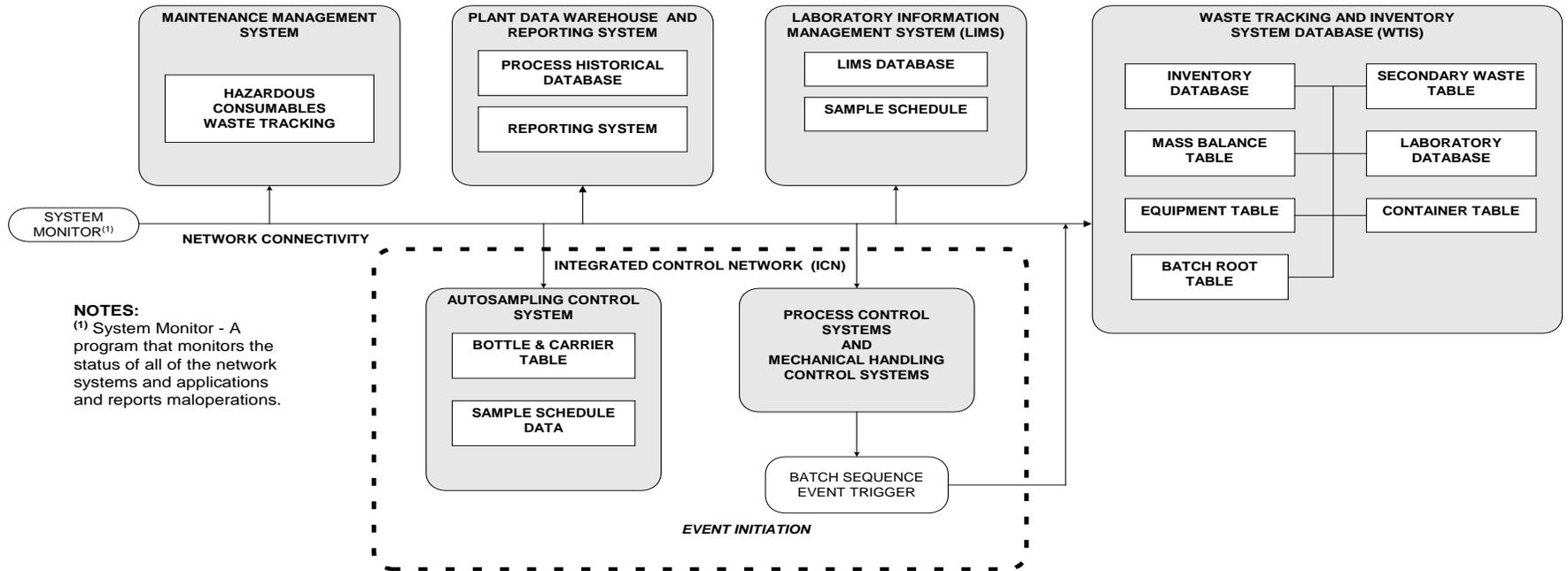
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Figure B1-2 Plant Information Network Data Relationships



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