

# River Corridor Closure Contract

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## Environmental Restoration Disposal Facility Waste Acceptance Criteria

June 2015

For Public Release

**Washington Closure Hanford**

Prepared for the U.S. Department of Energy, Richland Operations Office  
Office of Assistant Manager for River Corridor



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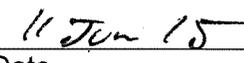
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Closure Contract** 

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## REVISION HISTORY

Revision	Date	Reason for revision	Revision initiator
4	4/2015	Reference DOE M 435.1-1 in Section 4.1 and 4.1.4 per Low-Level Waste Federal Review Group Comment. New Appendix B added to list radionuclides that may be added to profiles as "other isotopes present." These are added per UDQ-2014-001-E, Rev. 0. The original Appendix B is now Appendix C	M. A. Casbon
3	1/2014	Table 2 Radionuclides were revised to reflect tables E-1, E-3, & E4 of WCH-520 (ERDF Performance Assessment), changed to pCi/g basis, and incorporate inventory limits for certain radionuclides. These changes fulfill ERDF DAS Rev. 3 Condition 6 . The Inventory Guidelines section is deleted. Chelating agents section is expanded.	M. A. Casbon
2	10/2010	Table 1: Remove total Chromium from the table Section 4.2.3: Revise inventory guidelines for total uranium and carbon-14. Section 4.3.5: Clarify restrictions on disposal of free liquids.	M. A. Casbon
1	10/2009	Section 4.2.2: Clarified the guidelines for the three radionuclides requiring special consideration with regard to ERDF reporting: technetium-99, carbon-14, and total uranium. Section 4.2.2: Added Table 3, Total Curie Guidelines.	M. G. Peloquin
0	01/2008	Initial issuance	NA

## ACRONYMS

CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
CFC	chlorofluorocarbon
CFR	<i>Code of Federal Regulations</i>
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESD	Explanation of Significant Difference
LDR	land disposal restriction
OWTF	Onsite Waste Tracking Form
PCB	polychlorinated biphenyl
ppm	parts per million
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
RCW	<i>Revised Code of Washington</i>
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
SWAC	Supplemental Waste Acceptance Criteria
WAC	<i>Washington Administrative Code</i>
WCH	Washington Closure Hanford

## 1.0 INTRODUCTION

The Environmental Restoration Disposal Facility (ERDF) is authorized to operate through a *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) Record of Decision (ROD) issued by the U.S. Environmental Protection Agency (EPA) (EPA 1995). The ERDF is designed to serve as a waste isolation structure for bulk soil, demolition debris, and miscellaneous contaminated material from Hanford Site remediation activities conducted under CERCLA authority. An Explanation of Significant Difference (ESD) to the ERDF ROD was issued in 1996 to allow for disposal of investigation-derived waste (EPA 1996), and in 1997 an ROD amendment was issued allowing treatment of waste by encapsulation or stabilization (EPA 1997) and authorizing expansion of the ERDF. A 1999 ROD amendment delisted ERDF leachate from *Resource Conservation and Recovery Act of 1976* (RCRA) hazardous waste regulation contingent upon meeting certain criteria and requirements; a 2002 ROD amendment authorized further expansion of the ERDF and allowed staging of remediation waste at ERDF pending treatment (EPA 1999, 2002). In May 2007, an ROD amendment was signed authorizing ERDF disposal of specific Hanford-only wastes in storage and creating a “plug-in” approach for disposal of additional Hanford-only-generated waste in storage (EPA 2007).

### 1.1 PURPOSE

The purpose of this document is to establish the ERDF waste acceptance criteria for disposal of materials resulting from Hanford Site cleanup activities. Explanation of and compliance with the requirements of this document will enable implementation of appropriate measures to protect human health and the environment, ensure the integrity of the ERDF liner system, facilitate efficient use of the available space in the ERDF, and comply with applicable or relevant and appropriate requirements. To serve this purpose, the document defines responsibilities, identifies the waste acceptance process, and provides the primary acceptance criteria and regulatory citations to guide ERDF users. The information contained in this document is not intended to repeat or summarize the contents of all applicable regulations.

### 1.2 SCOPE

The ERDF is designed to RCRA minimum technology requirements and *Toxic Substances Control Act of 1976* specifications for chemical landfills. The facility is authorized to accept waste resulting from Hanford Site environmental restoration activities. The process and criteria for waste acceptance established by this document apply to the ERDF management and operations team and all users of the facility.

## 2.0 RESPONSIBILITIES

An EPA and Washington State Department of Ecology (Ecology) agreement has been developed for project management under a single regulatory agency. The EPA serves as the lead regulatory authority for oversight of ERDF operations. The lead agency for operation and

management of the ERDF is the U.S. Department of Energy. The Washington Closure Hanford (WCH) team and its subcontractors are responsible for managing and operating the ERDF on a day-to-day basis.

ERDF users are responsible for performing activities in accordance with this document and WCH policies and procedures. A system of checks and balances is in place to ensure that the appropriate level of coordination exists among the ERDF and its various users. A series of interface points is designed to communicate waste receipt schedules, waste quantity and form, characterization information, waste certification, treatment requirements, packaging, transportation, documentation, receipt, and disposal. A general description of the system is presented below and is detailed in the WCH procedure system.

## **2.1 ERDF MANAGEMENT AND OPERATIONS TEAM**

The ERDF management and operations team includes personnel assigned to provide oversight and to operate the facility and transport waste.

### **2.1.1 WCH Personnel**

The WCH personnel assigned to the ERDF management and operations team are responsible for the following:

- Reviewing and approving/rejecting profiles provided by ERDF users of new waste based on health and safety, chemical and radiological characteristics, ERDF liner compatibility, physical form, applicable or relevant and appropriate requirements, requirements set forth in this document, and the ERDF ROD (as amended) (EPA 1995, 1997, 1999, 2002, 2007, 2009).
- Managing the ERDF subcontracts.
- Integrating subcontractor services with ERDF users.
- Maintaining a proactive quality assurance oversight program for timely identification of deficiencies and implementation of appropriate corrective actions.

### **2.1.2 ERDF Operations**

The ERDF operations team is responsible for the following:

- Developing and maintaining waste acceptance plans, procedures, and supporting data to ensure consistency with the ERDF waste acceptance criteria, applicable regulatory requirements, and terms of the contract.
- Reviewing waste documentation against the waste acceptance criteria.
- Transporting waste in compliance with applicable environmental regulations and in coordination with ERDF users.
- Reviewing the waste shipment documentation against the waste profile information.

- Performing waste management inspections, as appropriate.
- Performing waste treatment at ERDF and maintaining cells and leachate systems.
- Managing records associated with disposal of waste at the ERDF.

## **2.2 ERDF USERS**

Users of the ERDF are responsible for the following:

- Considering ERDF requirements during the remedial design/remedial action process.
- Obtaining and/or confirming regulatory authority for disposal of waste at the ERDF and coordination at ERDF if necessary.
- Participating in routine planning as necessary.
- Developing, documenting, and implementing an appropriate sampling and analysis program approved by the lead regulatory agency (when required).
- Characterizing waste to ensure proper documentation of types and quantities of radionuclides, dangerous/hazardous constituents, and physical and chemical characteristics.
- Evaluating treatment options for waste disposal, when applicable.
- Conducting treatment in accordance with the approved process plan.
- Preparing the waste profile, designating the waste, and obtaining ERDF acceptance for each waste source or group of waste sources.
- Preparing an Onsite Waste Tracking Form (OWTF) or equivalent documentation required for each waste shipment.
- As required, interfacing with the ERDF management and operations team to ensure that packaging, labeling, and handling of each shipment is in compliance with the appropriate waste acceptance criteria and state/federal waste transport regulations.

## **3.0 WASTE ACCEPTANCE PROCESS**

Waste entering the ERDF shall be controlled on the basis of source, physical form, and contaminant concentration and activity levels. A uniform and consistent waste acceptance process shall be implemented to include planning, waste certification, shipment, receipt, and disposal.

### 3.1 PLANNING

ERDF users should provide long-term and operational project schedules to the ERDF management and operations team for use as a planning tool.

### 3.2 WASTE CERTIFICATION

Waste certification is the combination of characterization, designation, and verification in accordance with the requirements of WMT-1, *Waste Management and Transportation*, to ensure that the applicable acceptance criteria are met.

#### 3.2.1 Characterization

Characterization identifies the nature and extent of radioactive and dangerous/hazardous material contamination and describes the physical properties of the waste material. Characterization shall be performed in accordance with WMT-1, *Waste Management and Transportation*, based on historical analytical data, process knowledge, sample collection and analysis, or a combination thereof. Characterization objectives for activities involving sample collection and analysis will be identified in accordance with ENV-1, *Environmental Monitoring & Management*. Data quality will be assured through oversight and assessment.

**3.2.1.1 Radioactive Waste.** Radioactive waste constituents shall be adequately characterized to permit proper segregation, treatment, storage, and/or disposal. This characterization shall ensure that the major radionuclide content of the waste is known and recorded during the waste management process.

Major radionuclide is defined as any radionuclide that meets all of the following conditions:

- Has a half-life greater than 2 years
- Is present in a concentration in excess of 1 pCi/g
- Is not in secular equilibrium with a parent nuclide<sup>a</sup>
- Is not a naturally occurring radionuclide at an activity level consistent with levels determined in *Hanford Site Background: Part 2, Soil Background for Radionuclides* (DOE-RL 1996).

**3.2.1.2 Dangerous/Hazardous/Toxic or Mixed Waste.** Waste that is determined to be dangerous/hazardous/toxic shall be further evaluated to determine if the waste is prohibited and/or if the waste satisfies applicable treatment standards. Land disposal restriction (LDR) status of the waste shall be determined for dangerous/hazardous or mixed waste based on the 40 *Code of Federal Regulations* (CFR) 268, "Land Disposal Restrictions," Subpart D and *Washington Administrative Code* (WAC) 173-303-140, "Dangerous Waste Regulations," requirements. This determination may be satisfied by reference to existing waste

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<sup>a</sup> If both parent and daughter radionuclides are present in a waste stream and both have an inventory threshold listed in Table 2, both must be included in the profile covering that waste stream (e.g., U-233 and Th-229).

characterization data through waste analysis or by citation of pertinent LDR waivers or variances, as approved by the EPA or Ecology.

### **3.2.2 Waste Profile/Designation**

Based on the characterization information, waste profiles and a waste designation shall be developed and approved for each waste source (or sufficiently similar group of waste sources) in accordance with the requirements specified in WMT-1, *Waste Management and Transportation*. Waste profiles shall be provided to and approved by the ERDF management and operations team prior to any associated waste shipments to ensure compliance with the acceptance criteria and to facilitate planning of waste transportation and disposal actions.

Waste designation shall be confirmed through the verification program specified in Section 3.2.3. If a change to the waste designation is required as a result of verification activities, the ERDF management and operations team shall be notified.

### **3.2.3 Verification**

All ERDF users shall implement a verification program to ensure that waste intended for disposal at the ERDF is within the established waste profile. Verification activities may include application of process knowledge, observation, process monitoring, sample collection and analysis, or a combination thereof. Verification activities involving process monitoring or sample collection and analysis shall be planned and documented as specified in Section 3.2.1 and may include periodic ERDF oversight and assessment processes. For small waste streams (e.g., a single container, total volume from a spill), characterization and verification activities may consist of a single event.

If a determination is made through verification activities that the physical nature, constituents, or constituent concentrations are not covered or exceed those documented in the approved waste profile, the ERDF management and operations team shall be notified. After a project reevaluation of the assumptions used for waste profiling and characterization, the profile shall be revised to reflect the new values and submitted to the ERDF management and operations team.

## **3.3 SHIPMENT**

The shipment of waste for disposal at the ERDF is subject to the requirements of WMT-1, *Waste Management and Transportation*, and applicable regulations.

### **3.3.1 Transportation and Packaging**

All waste shipments on public roadways shall fully comply with applicable U.S. Department of Transportation regulations contained in 49 CFR, "Transportation." Where public roadways will not be used for waste transport, alternate packaging that meets safety standards equivalent to U.S. Department of Transportation requirements may be used.

### **3.3.2 Shipping Documentation**

All waste shipments shall be accompanied with the associated documentation required for disposal at the ERDF in accordance with WMT-1, *Waste Management and Transportation*.

### **3.3.3 Authorization to Ship**

A positive determination that a waste source meets the ERDF waste acceptance criteria shall be made prior to the associated waste being transported to the ERDF for disposal. Authorization to ship is provided through a waste disposal approval number that is obtained from the ERDF management and operations team on a per-shipment basis.

## **3.4 RECEIPT AND DISPOSAL**

Waste received at the ERDF that is within the established profile, meets the *Supplemental Waste Acceptance Criteria for the Environmental Restoration Disposal Facility* (ERDF SWAC) (WCH 2013b), has been authorized for disposal by a regulator-approved CERCLA or RCRA past-practice decision document (as described in Section 4.0), and is accompanied with the appropriate documentation (specified in Section 3.3.2) shall be disposed of in accordance with ERDF operations process.

### **3.4.1 Noncompliant Waste**

Waste shipped to the ERDF with noncompliant conditions shall require appropriate resolution prior to waste acceptance. Resolution alternatives may include, but are not limited to, correction of the noncompliant condition at the ERDF, conditional acceptance of the waste at the ERDF, or return of the waste to the source location for correction. Waste shall not be disposed of at the ERDF until the noncompliant condition is rectified. In addition to short-term rectification of the noncompliant condition to permit disposal, further steps shall be taken to determine the underlying cause of the problem and implement corrective actions as necessary to prevent recurrence. Noncompliance shall be addressed in a manner consistent with QA-1, *Quality Assurance*.

## **4.0 WASTE ACCEPTANCE CRITERIA**

The ERDF is authorized to accept radioactive, hazardous/dangerous, asbestos, polychlorinated biphenyls (PCBs), and mixed wastes only from cleanup of operable units within the 100, 200, and 300 Area National Priorities List sites of the Hanford Site in accordance with the ERDF ROD, ESD, and ROD amendments (EPA 1995, 1996, 1997, 1999, 2002, 2007, 2009). As provided in those documents, inactive treatment, storage, and disposal; RCRA past-practice; and decontamination and decommissioning waste may be placed in the ERDF through a remedial action ROD or removal action memorandum issued in accordance with CERCLA and the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300). Waste that has not been subjected to the waste acceptance process defined in Section 3.0 shall not be accepted for disposal at the ERDF.

## 4.1 CRITERIA BASIS

The basis for acceptance criteria includes protection of human health and the environment; protection of the ERDF liner system; control of waste form; compliance with environmental regulations as authorized by the ERDF ROD, ESD, and ROD amendments (EPA 1995, 1996, 1997, 1999, 2002, 2007, 2009); and compliance with DOE M 435.1-1, *Radioactive Waste Management Manual*.

### 4.1.1 Protection of Human Health and the Environment

Worker protection shall be provided by compliance with the requirements of the health and safety plans for the ERDF; 29 CFR 1910, "Occupational Safety and Health Standards"; and applicable 10 CFR, "Energy," and 49 CFR waste transportation regulations. Occupational exposure was evaluated in the *Remedial Investigation and Feasibility Study Report for the Environmental Restoration Disposal Facility* (ERDF RI/FS) (DOE-RL 1994) and helped establish the necessary dangerous/hazardous constituent limits that ensured occupational exposure is within required limits. The waste handling at the ERDF shall be consistent with maintaining worker exposure as low as reasonably achievable. Workers shall be protected from direct radiation and radioactive materials in accordance with the requirements of 10 CFR 835, "Occupational Radiation Protection."

The primary long-term routes of exposure to dangerous/hazardous constituents and the radionuclides that are of concern after placement of waste in the ERDF include the ingestion of contaminated groundwater or intrusion into the waste. The ERDF RI/FS (DOE-RL 1994) evaluated the risk from dangerous/hazardous constituents. The *Performance Assessment for the Environmental Restoration Disposal Facility, Hanford Site, Washington* (ERDF Performance Assessment) (WCH 2013a) and the RI/FS (DOE-RL 1994) evaluated the risk from radionuclides in the waste and established limits necessary to protect human health in accordance with the requirements of DOE O 435.1, *Radioactive Waste Management*. A crosswalk between the DOE O 435.1 waste acceptance criteria content requirements, this waste acceptance criteria, and additional documents is included in Appendix A.

### 4.1.2 Protection of the ERDF Liner System

A compatibility study of materials proposed for the ERDF liner system and expected waste leachate was performed as part of the *Evaluation of Liner/Leachate Chemical Compatibility for the Environmental Restoration Disposal Facility* (BHI 1995). The study concluded that the manufacturer-recommended limits associated with the high-density polyethylene geomembrane liners were several orders of magnitude higher than the estimated maximum ERDF leachate concentrations. Based on results of the study, dangerous/hazardous constituent concentration limits necessary to ensure liner integrity were established. The study did not show any threat to the liner from radionuclides.

Waste with constituents in sufficient concentration that could result in loss of liner integrity shall not be accepted. Waste with chemical constituents not listed in this section shall be evaluated by the ERDF management and operations team on a case-by-case basis. The evaluation shall consist of an evaluation showing that the new waste constituents are chemically equivalent to an approved constituent. If chemical equivalency cannot be determined through an evaluation, EPA Method 9090 (EPA 1986) may be required to show that leachate from the proposed waste is compatible with the liner material.

### 4.1.3 Control of Waste Form

The physical form of the waste shall be controlled to minimize void space in the ERDF and facilitate loading, transportation, unloading, and handling of waste. Additional implementation requirements regarding waste form are identified in the ERDF SWAC (WCH 2013b).

### 4.1.4 Compliance with Environmental Regulations

ERDF users shall determine whether waste is subject to LDR by completing a designation and, if designated as dangerous/hazardous, by evaluating concentrations for the constituents of concern against the applicable treatment standards or prohibition levels. Washington State LDR requirements are contained in WAC 173-303-140. The federal treatment standards and prohibition levels that apply to LDR waste are published in 40 CFR 268. For waste that is hazardous by characteristic, the underlying hazardous constituents specified in 40 CFR 268.48, "Universal Treatment Standards," that can reasonably be expected to be present at the point of generation of the hazardous waste shall also be evaluated. In the treatment of LDR waste, 40 CFR 268.3 prohibits diluting the waste as a substitute for adequate treatment. All waste analysis and supporting information relative to LDR compliance shall be retained at the ERDF for the life of the facility.

Waste profile and OWTF documentation for all dangerous/hazardous waste shipped to the ERDF shall include information similar to that found in 40 CFR 268.7, including waste code and applicable treatment standard, subcategory, and underlying dangerous/hazardous constituents. If the treatment standard is expressed in terms of a concentration limit, the actual concentration of the restricted constituent shall also be reported. If the waste has no listed waste codes and no longer exhibits the characteristic of a dangerous/hazardous waste because it has been treated, the OWTF shall include a statement describing the treatment technology that was used and the reason that the waste is no longer dangerous/hazardous.

An alternative to treatment of dangerous/hazardous waste to meet the LDR standards and allow for disposal of waste in the ERDF is a treatability variance or receipt of a CERCLA waiver. Appropriate documentation is required before shipment of any dangerous/hazardous waste to the ERDF that has previously been exempted from meeting the LDR treatment standard. Documentation may include an exclusion (or, for CERCLA onsite actions, demonstrating approved qualifications for an exclusion); a variance in accordance with 40 CFR 268.5, 40 CFR 268.6, or 40 CFR 268.44; or a waiver in accordance with 40 CFR 300.430(f)(1)(ii)(C).

The treatment and performance standard for dangerous/hazardous debris is specified in 40 CFR 268.45. Dangerous/hazardous debris must be treated either by the waste-specific standards in 40 CFR 268.40 for each waste contaminating the debris or the standards presented in the alternative treatment standards for dangerous/hazardous debris table found in 40 CFR 268.45.

Waste acceptance criteria for radionuclide concentrations and inventory limits are developed in the ERDF Performance Assessment (WCH 2013a). The Performance Assessment was performed in compliance with DOE M 435.1-1, *Radioactive Waste Management Manual*.

## 4.2 CONCENTRATION LIMITS

Prior to consideration of concentration limits, the site-specific acceptance requirements must be met in accordance with the ERDF ROD and ESD (EPA 1995, 1996). The ERDF concentration and performance limits for chemical constituents, radionuclides, and mixed wastes are provided in the following subsections.

### 4.2.1 Chemical Constituents

The LDR treatment standards for dangerous/hazardous waste codes are found in Subpart D of 40 CFR 268 and WAC 173-303-140 and should be consulted to confirm the most current LDR standard.

Secondary limits for various chemical constituents are identified in Table 1. Chemicals should be evaluated against the applicable standards in the LDR treatment standards before being evaluated against Table 1 criteria. Limits in Table 1 represent exposure limits determined by risk modeling in the ERDF RI/FS (DOE-RL 1994). Liner compatibility and worker exposure limits will be evaluated separately.

**Table 1. Chemical Concentration Limits. (2 Pages)**

Constituent Name	Limit (mg/kg) <sup>a</sup>
<b>Semivolatile Organic Compounds</b>	
Benzo(a)pyrene	2.5E+04
Benzo(k)fluoranthene	2.5E+04
<b>Pesticides/PCBs</b>	
4,4'DDD	7.6E+05
4,4'DDE	5.4E+05
PCBs	50 (liquids) <sup>b</sup>
Beta-BHC (Lindane)	3.3E+03
<b>Metals</b>	
Antimony	1.9E+04
Arsenic	3.0E+03
Barium	9.4E+05
Cadmium	3.9E+04
Chromium VI	5.9E+04
Manganese	4.4E+05
Selenium	4.0E+05
Silver	3.5E+05
Thallium	5.6E+03
Vanadium	3.3E+05

**Table 1. Chemical Concentration Limits. (2 Pages)**

Constituent Name	Limit (mg/kg) <sup>a</sup>
Zinc	3.0E+05

<sup>a</sup> Public exposure (DOE-RL 1994) is limiting.

<sup>b</sup> See Section 4.3.4.

BHC = benzene hexachloride

DDD = dichlorodiphenyldichloroethane

DDE = dichlorodiphenyldichloroethylene

PCB = polychlorinated biphenyl

**4.2.1.1 Identification of Underlying Hazardous Constituents.** Wastes that would be designated as RCRA dangerous wastes must meet the LDR standards identified in 40 CFR 268 and WAC 173-303-140 *prior* to placement in the ERDF. Dangerous wastes designated due to the presence of toxicity characteristic leaching procedure metals (waste codes D004- D011) are generally required to meet the LDR treatment standards for underlying hazardous constituents in 40 CFR 268.48 if the waste is generated under a decision document signed after May 1998. Toxicity characteristic leaching procedure metal wastes associated with CERCLA decision documents signed prior to May 1998 may be "grandfathered" such that compliance with the treatment standards of 40 CFR 268 in effect at the time of the decision document may be used in lieu of the current standards.

#### 4.2.2 Radionuclides

Concentration and total inventory limits established for radionuclides are identified in Table 2. All concentration limits are taken from the ERDF Performance Assessment (WCH 2013a), Appendix E, Table E-1. With regard to concentration limits, when two or more radionuclides are present in a waste, the "sum of the fractions" method shall be used to determine acceptability. Each constituent in the waste mixture must be divided by its limit from Table 2, with the sum being less than or equal to 1.0. Radionuclides with no value listed are taken from ERDF Performance Assessment (WCH 2013a), Appendix E, Table E-3, and need not be included in sum of the fraction calculations.

Inventory limits, where listed, are taken from Table E-4 of the same document and are also subject to sum of the fractions. Two separate sum of the fraction calculations are required. Radionuclides with inventory limits fall into one of two separate categories: (1) those contributing to the 25-mrem all-pathways limit (Table 2 footnote c), or (2) those contributing to the 10-mrem air-pathway limit (Table 2 footnote d). The peak doses for the 25-mrem all-pathways and the 10-mrem air-pathway occur at significantly different times and do not overlap. The 10-mrem air-pathway peak occurs at less than 1,000 years and declines sharply afterward, while the 25-mrem all-pathways peak, which is primarily groundwater based, reaches its maximum value at 6,500 to 7,500 years. Therefore, separate sum of the fraction calculations will be performed for each category.

Some radionuclides are subject to greater than U.S. Nuclear Regulatory Commission Class C or transuranic limits (Table 2 footnotes f and g, respectively). These two limits take precedence over the values given in Table 2. However, the performance assessment-derived limits are shown for use in sum of the fractions calculations. Radionuclides with no values shown in the

Threshold Concentration or Total Inventory Limit columns have no limits in those categories. No special limits are set for activated metals.

Additional radionuclides that may be encountered during cleanup activities, but which exist in insignificant (i.e., less than 1 Ci projected at closure) quantities or are merely relics of calculations or modeling (e.g., ORIGEN2), have been evaluated in UDQ-2014-001-E (WCH 2015). They are assigned neither Threshold Concentrations nor Inventory Thresholds and may be added to profiles as “other isotopes present.” A complete list of these may be found in Appendix B. Radionuclides may only be added to the list in Appendix B by evaluating them in the Unreviewed Disposal Question process as described in the ERDF Performance Assessment (WCH 2013a) and WO-100, *Waste Operations Procedures*, WO-100-1.5, “Unreviewed Disposal Question (UDQ).”

Additional criteria for removable surface contamination, fixed contamination, and activity levels are prescribed in the ERDF SWAC (WCH 2013b). Certain waste sources may require special handling to accommodate disposal at the ERDF even though the radionuclide concentrations are less than the Table 2 limits. Handling requirements for these waste sources shall be evaluated on a case-by-case basis.

**Table 2. Radionuclide Concentration and Inventory Limits. (4 Pages)**

Constituent	Threshold Concentration (pCi/g)	Total Inventory Limit (Ci)	Footnotes
Ac-227	2.83E+03		
Ag-108m	6.99E+04		
Am-241	8.25E+04		g
Am-242m			a, g
Am-243	6.49E+04		g
Ba-133			a
Be-7			a
Bi-207			a
C-14	2.43E+05	2.43E+04	d, f
Ca-41			b
Cd-113m	1.00E+06		
Ce-144			a
Cf-249			a, g
Cf-252			a
Cl-36	4.32E+03	3.42E+02	c
Cm-242			a, f
Cm-243	8.98E+05		g
Cm-244	4.76E+06		f
Cm-245			a, g
Cm-246			a, g

**Table 2. Radionuclide Concentration and Inventory Limits. (4 Pages)**

Constituent	Threshold Concentration (pCi/g)	Total Inventory Limit (Ci)	Footnotes
Cm-247			a, g
Cm-248			a, g
Co-58			a
Co-60	7.18E+09		
Cs-134			a
Cs-135			a
Cs-137	8.47E+05		f
Eu-150			a
Eu-152	1.23E+07		
Eu-154	1.75E+08		
Eu-155			a
Fe-55			a
Fe-59			a
H-3	2.34E+11	1.15E+06	d
I-129	3.63E+04	4.00E+00	d, f
K-40			e
Kr-85			a
Mn-54			a
Mo-93	3.35E+05	8.11E+02	c
Na-22			a
Nb-93m	2.82E+09		
Nb-94	5.90E+04	3.49E+02	c, f
Ni-59	2.48E+07		f
Ni-63	1.97E+07		f
Np-237	3.00E+04		g
Pa-231	2.29E+03		
Pb-210			a
Pd-107			a
Pm-147			a
Po-209			a
Pu-238	1.41E+05		g
Pu-239	5.87E+04		g
Pu-240	5.92E+04		g
Pu-241	3.65E+08		f
Pu-242	6.15E+04		g

**Table 2. Radionuclide Concentration and Inventory Limits. (4 Pages)**

Constituent	Threshold Concentration (pCi/g)	Total Inventory Limit (Ci)	Footnotes
Pu-244			a, g
Ra-226	5.04E+03		
Ra-228	1.60E+03		
Re-187			a
Rn-222			e
Ru-103			a
Ru-106			a
Sb-125			a
Sb-126			a
Se-79	2.19E+05		
Sm-151	2.49E+08		
Sn-113			a
Sn-121m	3.16E+06		
Sn-126	2.59E+04		
Sr-90	1.05E+05		f
Tc-99	2.38E+04	7.24E+02	c, f
Th-228			a
Th-229	5.13E+03		
Th-230	3.94E+04		
Th-232	2.26E+04		
Th-234			a
Ti-44			a
U-232			a
U-233	2.64E+05		
U-234	2.73E+05		
U-235	2.10E+05		
U-236	2.90E+05		
U-238	2.87E+05		
Zn-65			a
Zr-93	1.97E+07		

<sup>a</sup> No limit calculated due to no, or negligible, inventory at closure; ERDF Performance Assessment, Appendix E, Table E-3 (WCH 2013a).

<sup>b</sup> Ca-41 screened out due to association with impurities present in graphite and silica gel desiccant in trace quantities and will not be available freely; ERDF Performance Assessment, Appendix E, Table E-3, footnote c (WCH 2013a).

<sup>c</sup> Total Inventory Limits from the ERDF Performance Assessment Appendix E, Table E-4, 25 mrem/yr all pathway (groundwater) (WCH 2013a).

**Table 2. Radionuclide Concentration and Inventory Limits. (4 Pages)**

Constituent	Threshold Concentration (pCi/g)	Total Inventory Limit (Ci)	Footnotes
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- <sup>d</sup> Total inventory limits from the ERDF Performance Assessment, Appendix E, Table E-4, 10 mrem/yr air pathway (WCH 2013a).
- <sup>e</sup> No limit calculated per the ERDF Performance Assessment, Appendix E, Table E-1, footnote a (WCH 2013a).
- <sup>f</sup> Evaluation of the NRC Class is required and may be limiting per Section 4.3.5.
- <sup>g</sup> Evaluation of TRU criteria is required and may be limiting per Section 4.3.5.
- ERDF = Environmental Restoration Disposal Facility  
 NRC = U.S. Nuclear Regulatory Commission  
 TRU = transuranic

Waste sources with concentration levels above the limits identified in Table 2 are evaluated on a case-by-case basis in accordance with the approach agreed to by EPA, Ecology, and the U.S. Department of Energy, Richland Operations Office in the “ERDF Waste Acceptance Criteria Exceedance” meeting minutes dated September 19, 1996 (BHI 1996). If the integrated inventory concentration of the waste source is not greater than the Table 2 limits, the waste is then acceptable for transportation and disposal at ERDF.

#### 4.2.3 Mixed Waste

The limits established for mixed waste are specified in Sections 4.2.1 and 4.2.2 for chemical components and radionuclides, respectively.

### 4.3 SPECIAL-CASE WASTE TYPES

Acceptance criteria and/or restrictions associated with special-case waste types are identified in the following subsections. Centralized waste treatment consisting of stabilization or macroencapsulation may be performed at the ERDF for specific sources in accordance with the 1997 ROD amendment to render a previously restricted waste acceptable for disposal. All substantive requirements governing hazardous waste treatment in containers, including provision of secondary containment, shall be met for waste treated at ERDF. Uncontainerized waste stored or treated at ERDF shall be managed in accordance with the corrective action management unit provisions delineated in the 2002 ERDF ROD amendment (EPA 2002). Users shall obtain authorization for waste treatment at the ERDF from the management and operations team prior to shipment. In addition, remediation waste treatment requirements, including the specific treatment to be performed, must be documented in the regulator-approved decision document for the operable unit or waste site of origination.

#### 4.3.1 Asbestos

Asbestos-containing materials shall be managed in accordance with 40 CFR 61.140 through 40 CFR 61.157. Additional and more detailed information for asbestos management is also supplied in WMT-1, *Waste Management and Transportation*, and the ERDF SWAC (WCH 2013b).

#### **4.3.2 Ion-Exchange Resins and Granular-Activated Carbon**

Ion-exchange resins and granular-activated carbon shall be thoroughly drained and stable before they are transported for disposal to prevent reaction with their surroundings and the generation of excessive heat. Containers shall be vented and/or a catalyst pack may be required if the material is capable of generating gas. Ion-exchange resins and granular-activated carbon may be subject to restrictions associated with organic carbonaceous compounds, as specified in Section 4.3.5.

#### **4.3.3 Debris**

The definition of debris is presented in Appendix C. Special requirements for debris are as follows.

- The initial determination of whether a waste is a dangerous/hazardous debris shall be made at the source in accordance with 40 CFR 268.45 and other applicable waste designation requirements. After waste has been identified as dangerous/hazardous debris, it shall be so stated as part of the waste profile.
- Dangerous/hazardous debris shall comply with the debris treatment standards (40 CFR 268.45) or the otherwise applicable LDR treatment standard.
- Waste containing more than one type of debris or one hazardous constituent shall be treated to meet the standards for each hazardous constituent and each type of debris, as applicable.

#### **4.3.4 Polychlorinated Biphenyl Compounds**

Waste containing PCB concentrations of greater than 50 parts per million (ppm) shall be managed in accordance with 40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions." Liquids containing PCBs at concentrations exceeding 50 ppm PCB at the point of origination are generally prohibited from disposal in ERDF, even if subsequently stabilized to eliminate free liquids. On a case-by-case basis with the approval of ERDF operations, PCB-bearing liquids from incidental sources (e.g., precipitation, condensation, leachate, or load separation associated with PCB articles or nonliquid PCB waste) with PCB concentrations below 500 ppm may be disposed of in ERDF in accordance with the requirements of 40 CFR 761.60(a)(3). Liquid waste containing PCB concentrations of greater than 500 ppm cannot be disposed of at the ERDF.

Nonliquid PCBs in the form of contaminated soil, rags, other debris may be disposed of at the ERDF (this includes nonliquid waste with PCB concentrations greater than 500 ppm).

#### 4.3.5 General Restrictions

The following materials are prohibited from being disposed at the ERDF:

- Waste capable of detonation, explosive decomposition, reaction at normal pressures and temperature, or explosive reaction with water. This includes unreacted alkali metal (e.g., sodium). Chemicals that react with atmospheric oxygen to form shock-sensitive organic peroxides are prohibited at concentrations that are capable of generating an explosive reaction.
- Waste capable of generating toxic gases, vapors, or fumes harmful to persons transporting, handling, and disposing the waste.
- Gaseous waste packaged at a pressure in excess of 1.5 atmospheres at 20 °C (68 °F).
- Transuranic waste, as defined in Appendix C.
- Spent nuclear fuel and high-level waste, as defined in Appendix C.

The following materials are restricted from disposal at the ERDF until the listed conditions have been met:

- Wastes containing free liquids
  - Free liquid that is not a dangerous waste: Disposal of any free liquid waste (containerized or not) that is not a dangerous waste is prohibited. Such wastes must be sorbed or stabilized to a nonliquid form prior to disposal in ERDF. (WAC 173-303-140(4)(b))
  - Free liquid that is, or is associated with, a dangerous waste: Disposal of free liquids that are, or are within, a dangerous waste (containerized or not) is prohibited, except as provided below. Any free liquids associated with noncontainerized dangerous waste must be stabilized (not merely absorbed) prior to placement in ERDF. Any free liquids associated with containerized dangerous waste must be sorbed with a nonbiodegradable sorbent prior to placement in ERDF, except for the following:
    - Very small containers (e.g., ampules)
    - Containers designed to hold free liquids for use other than storage (e.g., a battery or capacitor)
    - Laboratory packs packaged in accordance with WAC 173-303-161. (WAC 173-303-140(4)(b))

If necessary, the presence of free liquids shall be determined by EPA Method 9095 (“Paint Filter Liquids Test”) (EPA 1986) before shipment to the ERDF. (WAC 173-303-140(4)(b))

- Ignitable or reactive dangerous waste unless treated prior to disposal such that the resultant mixture no longer exhibits the ignitable or reactive characteristic, except for waste disposed of as a labpack in accordance with WAC 173-303-161. (40 CFR 264.312)
- Incompatible wastes or materials shall not be placed in close proximity to each other in the same landfill cell unless such action is done in a manner that prevents adverse reactions that could result in generation of extreme heat, flames, violent reactions, gases, toxic fumes, dusts or gases; pose a fire or explosion risk; damage the structural integrity of the facility; or through other like means threaten human health or the environment. (40 CFR 264.313)
- Unless they are very small (e.g., an ampule), containers must not be disposed of unless they are at least 90% full when placed in the landfill or they are crushed, shredded, or similarly reduced in volume to the maximum practical extent before burial. (40 CFR 264.315)
- Pyrophoric waste, unless treated, prepared, and packaged to be nonflammable prior to being disposed. (10 CFR 61.56)
- Solid acid waste that exhibits the characteristic of low pH under the corrosivity test of WAC 173-303-090(6)(a)(iii), unless exempted pursuant to WAC 173-303-140 or the *Revised Code of Washington* (RCW) 70.105.050(2), "Hazardous Waste Management."
- Refrigerant-bearing equipment containing chlorofluorocarbons (CFCs), unless CFC removal has been completed. (40 CFR 82)
- Waste, materials, or containers that may adversely affect waste handlers or compromise facility or waste container performance.
- Dangerous/hazardous waste with greater than 10% organic/carbonaceous compounds, unless exempted pursuant to WAC 173-303-140 or RCW 70.105.050(2). (Note: The Hanford Site has a global exemption from this requirement for disposal of *radioactive* mixed waste in the ERDF.)
- Waste exceeding the Class C limit, as defined in 10 CFR 61.55, "National Emission Standards for Hazardous Air Pollutants," unless justified by a specific performance assessment.
- Extremely hazardous waste, unless exempted pursuant to WAC 173-303-140 or RCW 70.105.050(2). This includes the Washington State-only extremely hazardous wastes for toxic and persistent compounds (waste codes WT01, WP01, or WP03) as defined in WAC 173-303-100. Waste that is excluded from disposal at the ERDF because of its classification under the waste code WT01 may be tested using bioassay methods to show that the waste actually should be classified as WT02, which can be accepted at the ERDF.
- Waste containing biological, pathogenic, or infectious material (including "any substance that may harbor or transmit pathogenic organisms" [e.g., septic tank sludge]) unless disinfected. (10 CFR 61.56)
- Waste containing greater than 1% chelating compounds by weight, unless the waste has been solidified or stabilized. Waste containing more than 1% chelating compounds may be

approved for disposal on a case-by-case basis if evidence is provided that the chelating agents will not result in mobilization of radioisotopes. *Radionuclide-Chelating Agent Complexes in Low-Level Radioactive Decontamination Waste; Stability, Adsorption and Transport Potential* (NUREG 2002) provides evidence that weaker binding organic complexants (e.g, picolinate, citrate, and oxalate) will not appreciably mobilize metals, even in high pH environments such as cementitious waste forms. Therefore, these chelating agents are excluded from the 1% limit. Other weak chelating agents may be excluded on a case-by-case basis.

- Dangerous/hazardous waste carrying the F020, F021, F022, F023, F026, or F027 waste codes, unless authorized by an EPA-approved management plan that addresses the substantive requirements of 40 CFR 264.317.

#### **4.4 PHYSICAL LIMITS**

Packaged waste shall be structurally stable for disposal at ERDF to limit potential subsidence. Packaged waste that is not structurally stable may be accepted at ERDF on a case-by-case basis and stabilized before and during disposal. Depending on the waste stream, stabilization may be accomplished by using soil, cement-based or other stabilization agents with acceptable structural characteristics, size reduction, a mixture of biodegradable waste and stabilizing agents, and/or voids filled with stabilization agents. Additional physical limits for waste forms including concrete, steel plate, piping and tube steel, building debris, structural steel, containerized waste, equipment, soft waste, and rebar are defined in the ERDF SWAC (WCH 2013b).

### **5.0 REFERENCES**

- 10 CFR, "Energy," *Code of Federal Regulations*, as amended.
- 10 CFR 61, "Licensing Requirements for Land Disposal of Radioactive Waste," *Code of Federal Regulations*, as amended.
- 10 CFR 835, "Occupational Radiation Protection," *Code of Federal Regulations*, as amended.
- 29 CFR 1910, "Occupational Safety and Health Standards," *Code of Federal Regulations*, as amended.
- 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants," *Code of Federal Regulations*, as amended.
- 40 CFR 82, "Protection of Stratospheric Ozone," *Code of Federal Regulations*, as amended.
- 40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, as amended.
- 40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*, as amended.

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, as amended.

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*Toxic Substances Control Act of 1976*, 15 U.S.C. 2601, et seq.

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WMT-1, *Waste Management and Transportation*, Washington Closure Hanford, Richland, Washington.

WO-100, *Waste Operations Procedures*, Washington Closure Hanford, Richland, Washington.

**APPENDIX A**

**ERDF PERFORMANCE ASSESSMENT WASTE ACCEPTANCE CRITERIA  
REVIEW CRITERIA MATRIX**

## APPENDIX A

### ERDF PERFORMANCE ASSESSMENT WASTE ACCEPTANCE CRITERIA REVIEW CRITERIA MATRIX

The waste acceptance criteria format and content are preserved for usability. A matrix is presented below as a crosswalk from this waste acceptance criteria and other documents to Chapter 6, "Waste Acceptance Criteria Annotated Outline," of the January 2013 Draft DOE Standard for Radioactive Waste Management Disposal Authorization Statement Technical Basis Documentation.

Section	Performance Assessment Review Criteria	ERDF Waste Acceptance Criteria Section
1.0	The WAC must provide a brief "background" discussion and the technical basis upon which the criteria are based.	Section 1.0 Introduction Section 4.2 Concentration Limits
2.0	The WAC must specify acceptable radiological limits.	Section 4.2.2, Radionuclides SWAC <sup>a</sup> WMT-1, <i>Waste Management and Transportation</i> <sup>b</sup>
3.0	The WAC must specify acceptable waste form criteria.	Section 4.1.3, Control of Waste Form (points to SWAC <sup>a</sup> ) Section 4.3, Special-Case Waste Types Section 4.3.5, General Restrictions Section 4.4, Physical Limits WMT-1, <i>Waste Management and Transportation</i> <sup>b</sup> SWAC <sup>a</sup>
4.0	The WAC must specify acceptable packaging criteria.	Section 3.3.1, Transportation and Packaging (very brief, points to DOT) Section 4.4, Physical Limits WMT-1, <i>Waste Management and Transportation</i> <sup>b</sup> SWAC <sup>a</sup>
5.0	The WAC must specify acceptable waste transfer and transportation requirements.	Section 3.3.1, Transportation and Packaging (very brief, points to DOT) Section 3.3.3, Authorization to Ship WMT-1, <i>Waste Management and Transportation</i> <sup>b</sup> SWAC <sup>a</sup>
6.0	The WAC must specify acceptable documentation requirements.	Section 3.3.2, Shipping Documentation (very brief, points to WMT-1 <sup>b</sup> ) Section 4.1.4, Compliance with Environmental Regulations WMT-1, <i>Waste Management and Transportation</i> <sup>b</sup> SWAC <sup>a</sup>

Section	Performance Assessment Review Criteria	ERDF Waste Acceptance Criteria Section
7.0	The WAC must specify the process for evaluating and accepting waste shipments.	Section 3.4, Receipt and Disposal (points to Section 3.3.2 and SWAC <sup>a</sup> ) WO-100-1.2, ERDF Waste Acceptance Procedure <sup>c</sup> WMT-1, <i>Waste Management and Transportation</i> <sup>b</sup>

<sup>a</sup> WCH, 2013, *Supplemental Waste Acceptance Criteria for the Environmental Restoration Disposal Facility*, 0000X-DC-W0001, latest revision, Washington Closure Hanford, Richland, Washington.

<sup>b</sup> WMT-1, *Waste Management and Transportation*, Washington Closure Hanford, Richland, Washington.

<sup>c</sup> WO-100, *Waste Operations Procedures*, Washington Closure Hanford, Richland, Washington.

DOT = U.S. Department of Transportation

ERDF = Environmental Restoration Disposal Facility

SWAC = supplemental waste acceptance criteria

WAC = waste acceptance criteria

**APPENDIX B**

**NON-INVENTORY DATA PACKAGE WASTE  
MANAGEMENT INFORMATION SYSTEM RADIONUCLIDES**

## APPENDIX B

### NON-INVENTORY DATA PACKAGE WASTE MANAGEMENT INFORMATION SYSTEM RADIONUCLIDES

The radionuclides listed below are included in the Waste Management Information System, but were not included in the *Inventory Data Package for ERDF Waste Disposal* (WCH 2013a). They are listed below in Table B-1 for those with a half-life over 6 years and insignificant (i.e., less than 1 Ci) projected inventory at the Environmental Restoration Disposal Facility closure, and in Table B-2 those with a half-life of less than 6 years. Radionuclides may only be added to the list after they have been evaluated in the Unreviewed Disposal Question process as described in the *Performance Assessment for the Environmental Restoration Disposal Facility, Hanford Site, Washington* (WCH 2013b), and WO-100, *Waste Operations Procedures, WO-100-1.5, "Unreviewed Disposal Question (UDQ)."*

**Table B-1. Half-Life Greater than 6 Years.**

Radionuclide	Half-life (yrs)
Ar-39	269
Ar-42	32.9
Be-10	1.513E+6
Bk-247	1379
Cf-250	13.09
Cf-251	900.6
Cm-250	8304.8
Fe-60	1.49E6
Gd-152	1.081E+14
Nb-91	681.8
Si-32	132.2
Sm-147	1.062E+11
Te-123	5.993E+14

**Table B-2. Half-Life Less than 6 Years. (3 Pages)**

Radionuclide	Half-life (days)
Ac-228	0.25541667
Ag-108	0.001646
Ag-109m	0.0004609
Ag-110	0.0002826
Ag-110m	249.8
Al-28	0.001556
As-75m	1.85185E-14
Au-195	186.1
Ba-137m	0.001772222
Ba-140	12.74
Bi-212	0.04208
Bi-214	0.01368

**Table B-2. Half-Life Less than 6 Years. (3 Pages)**

<b>Radionuclide</b>	<b>Half-life (days)</b>
Bk-250	0.13425
Ca-45	162.7
Cd-109	462.6
Ce-141	32.5
Co-56	77.3
Co-57	271.8
Cr-51	27.71
Cs-136	13.16
Es-254	275.5
Ga-68	0.04745
Gd-153	242
Gd-155m	7.35E-14
Gd-162	0.007222
Ge-68	270.8
Hf-175	70
Hf-181	42.38
Hg-203	46.6
I-123	0.5425
I-125	59.43
I-131	8.04
In-113m	0.06908333
La-140	1.678
Lu-175m	4.97685E-16
Nb-94m	4.35E-03
Nb-95	34.98
Nb-95m	3.608
Nd-147	10.98
P-32	14.26
P-33	25.4
Pb-207m	1.516E-15
Pb-208m	1.968E-16
Pb-212	0.4435
Pb-214	0.01861111
Po-210	138.4
Pr-144	0.01201
Pt-195m	4.02
Pu-236	1059
Ra-224	3.665
Rb-82	0.000868056
Rb-83	86.2
Rb-84	32.77
Rb-86	18.66
Rh-103m	0.03897222
Rh-106	0.000344907
S-35	87.5
Sb-122	2.681

**Table B-2. Half-Life Less than 6 Years. (3 Pages)**

<b>Radionuclide</b>	<b>Half-life (days)</b>
Sb-124	60.24
Sb-126m	0.01319444
Sc-44	0.16363
Sc-46	83.82
Sc-47	3.422
Se-75	119.6
Si-31	0.10923611
Sn-119m	293
Sn-123m	0.02783
Sr-82	25.56
Sr-85	64.85
Sr-87m	0.116875
Sr-89	50.52
Ta-181m	1.25E-13
Ta-182	114.7
Ta-183	5
Tb-162	0.005389
Te-121	16.78
Te-125m	58
Te-127	0.3896
Te-127m	109
Te-129	0.04826
Te-129m	33.8
Ti-51	0.004028
Tl-203m	3.218E-15
Tl-204	1384
Tl-208	0.00212
Tm-170	128.6
U-237	6.75
V-49	330
W-183m	0.0000625
W-185	75.1
Xe-129m	1.157E-14
Xe-131m	11.9
Xe-133	5.245
Y-87	3.3458333
Y-88	106.6
Y-90	2.669
Yb-170m	1.852E-14
Zr-95	64.03

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WO-100, *Waste Operations Procedures*, WO-100-1.5, "Unreviewed Disposal Question (UDQ)", latest revision, Washington Closure Hanford, Richland, Washington

**APPENDIX C**  
**DEFINITIONS**

## APPENDIX C

### DEFINITIONS

**Carbonaceous waste:** Dangerous/hazardous waste that contains combined concentrations of greater than 10% organic/carbonaceous constituents. Organic/carbonaceous constituents are those substances that contain carbon-hydrogen, carbon-halogen, or carbon-carbon chemical bonding.

**Dangerous/hazardous debris:** Debris that contains a dangerous/hazardous waste listed in 40 *Code of Federal Regulations* (CFR) 261, "Identification and Listing of Hazardous Waste," Subpart D or that exhibits a characteristic of dangerous/hazardous waste identified in 40 CFR 261 Subpart C.

**Dangerous waste:** Solid waste designated under the dangerous waste lists, characteristics, or criteria set forth in Washington State's authorized *Resource Conservation and Recovery Act of 1976* (RCRA) program (*Washington Administrative Code* [WAC] 173-303-070 through 173-303-100) as either dangerous or extremely hazardous waste.

**Debris:** Solid material exceeding a 60-mm particle size that is intended for disposal and is a manufactured object, plant or animal matter, or natural geologic material. However, the following materials are not considered to be debris: any material for which a specific treatment standard is provided in 40 CFR 268, "Land Disposal Restrictions," Subpart D, namely lead acid batteries, cadmium batteries, and radioactive lead solids; process residuals, such as smelter slag and residues from the treatment of waste, wastewater, sludges, or air emission residues; and intact containers of dangerous/hazardous waste that are not ruptured and that retain at least 75% of their original volume. A mixture of debris and other material that has not been treated to the standards provided by 40 CFR 268.45 is subject to regulation as debris if the mixture is composed primarily of debris, by volume, based on visual inspection.

**Disinfection:** A process that inactivates pathogenic organisms by chemical oxidants or equivalent agents.

**Free liquids:** Liquids that can readily separate from the solid portion of a waste under ambient temperature and pressure. The Paint Filter Liquids Test (Method 9095 of SW-846 [EPA 1986]) is used to determine if a waste contains free liquids.

**Hazardous substances:** Any material designated as such pursuant to the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, including all RCRA hazardous wastes, radionuclides, and a variety of other chemical substances; and any material identified as a hazardous substance pursuant to the "Model Toxics Control Act – Cleanup" (WAC 173-340), including petroleum, petroleum products, and all dangerous wastes.

**Hazardous waste:** Waste designated as hazardous by the U.S. Environmental Protection Agency regulations (40 CFR 261) and that is regulated under RCRA.

**High-level waste:** Highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and

other highly radioactive material that is determined, consistent with existing law, to require permanent isolation.

**Infectious waste:** Wastes containing living organisms that, when present, could endanger human health or the health of domestic animals or wildlife by extending the range of biological pests, viruses, pathogenic micro-organisms, or other agents capable of infesting, infecting, or extensively and permanently altering the normal populations of organisms.

**Low-level waste:** Radioactive waste that is not high-level radioactive waste, spent nuclear fuel, transuranic waste, byproduct material (as defined in section 11e.[2] of the *Atomic Energy Act of 1954*, as amended), or naturally occurring radioactive material.

**Mixed waste:** Waste containing both radioactive and dangerous/hazardous components, as defined by the *Atomic Energy Act of 1954* (as amended) and WAC 173-303, respectively.

**Onsite Waste Tracking Form:** A shipping form used to identify the quantity, composition, origin, routing, and destination of waste while the waste is being transported to the Environmental Restoration Disposal Facility (ERDF) for disposal. The Onsite Waste Tracking Form is similar to the Uniform Hazardous Waste Manifest.

**Radioactive waste:** Any garbage, refuse, sludges, and other discarded material, including solid, liquid, semi-solid, or contained gaseous material that must be managed for its radioactive content (adapted from 40 CFR 240, "Guidelines for the Thermal Processing of Solid Wastes").

**Secular equilibrium:** A state of parent-daughter equilibrium achieved when the half-life of the parent is much longer than the half-life of the daughter. In this case, if the two are not separated, the daughter will eventually be decaying at the same rate at which it is being produced. At this point, both parent and daughter will decay at the same rate until the parent is essentially exhausted.

**Solidification:** A technique that limits the solubility and mobility of dangerous/hazardous waste constituents through physical means.

**Spent nuclear fuel:** Fuel that has been withdrawn from a nuclear reactor following irradiation but that has not been reprocessed to remove its constituent elements.

**Stabilization:** A technique that limits the solubility and mobility of dangerous/hazardous waste constituents by bonding or chemically reacting with the stabilizing material.

**Structural stability:** A structurally stable waste form will generally maintain its physical dimensions and its form under the expected disposal conditions, such as weight of overburden and compaction equipment, the presence of moisture and microbial activity, and internal factors such as radiation effects and chemical changes for a period of over 300 years. Structural stability can be provided by the waste form itself, processing the waste to a stable form, or placing the waste in a disposal container or structure that provides stability after disposal.

**Supplemental waste acceptance criteria:** Acceptance criteria established for operational radiological controls and physical limits for bulk shipments at the ERDF.

**Transuranic waste:** Radioactive waste containing more than 100 nCi (3,700 Bq) of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years.

**Treatment:** Any method, technique, or process designed to change the physical or chemical character of waste to render it less hazardous; make the waste safer to transport, store, or dispose of; or reduce the waste in volume.

**Waste shipment:** A "waste shipment" refers to a discernible volume of waste materials for which representative characterization information has been compiled. A small waste shipment may consist of a single truckload, while larger waste shipments may require several truckloads to transport the entire shipment to the ERDF. For large waste shipments, the same representative characterization information may be used on all associated waste tracking forms for that particular shipment, provided that the information represents the actual waste contents.

## REFERENCES

40 CFR 240, "Guidelines for the Thermal Processing of Solid Wastes," *Code of Federal Regulations*, as amended.

40 CFR 261, "Identification and Listing of Hazardous Waste," *Code of Federal Regulations*, as amended.

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

*Atomic Energy Act of 1954*, 42 U.S.C. 2011, et seq.

*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, 40 U.S.C. 9601, et seq.

EPA, 1986, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, SW-846, 3<sup>rd</sup> edition, revised, U.S. Environmental Protection Agency, Washington, D.C.

*Resource Conservation and Recovery Act of 1976*, 42 U.S.C. 6901, et seq., as amended.

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

WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, as amended.

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