



## 2.5 Waste Management and Chemical Inventories

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Waste produced from Hanford Site cleanup operations is classified as either radioactive, nonradioactive, mixed, or toxic. Radioactive waste is categorized as transuranic, high-level, and low-level. Mixed waste has both radioactive and hazardous nonradioactive substances. Hazardous waste

contains either dangerous waste or extremely hazardous waste or both, as defined in WAC 173-303. Hanford's hazardous waste is managed in accordance with WAC 173-303. Approximately 200 Hanford Site facilities have the capacity to generate dangerous and toxic waste.

### 2.5.1 Waste Management

Radioactive and mixed waste is currently handled in several ways. High-level waste is stored in single- and double-shell tanks. Low-level waste is stored in double-shell tanks, on storage pads, or is buried. The method used to manage low-level waste depends on the source, composition, and concentration of the waste. Transuranic waste is stored in vaults or on underground and aboveground storage pads from which it can be retrieved.

An annual report lists the dangerous waste and extremely hazardous waste generated, treated, stored, and disposed of onsite and offsite (DOE/RL-2000-14, Rev. 0). Dangerous waste is treated, stored, and prepared for disposal at several Hanford Site facilities. Dangerous waste generated at the site also is shipped offsite for disposal, destruction, or recycling.

Nondangerous waste generated at the Hanford Site has historically been buried near the 200 Areas Solid Waste Landfill. Beginning in December 1995, nondangerous waste has been disposed of at the city of Richland's Landfill, a municipal landfill located at the southern edge of the Hanford Site boundary. Since 1996, medical waste has been shipped to Waste Management of Kennewick. Asbestos has been shipped to Basin Disposal, Inc. in Pasco and the

onsite Environmental Restoration Disposal Facility. Since 1996, nonregulated drummed waste has been shipped to Waste Management of Kennewick.

Nondangerous waste originates at a number of areas across the site. This waste consists of construction debris, office trash, cafeteria waste, and packaging materials. Other materials and items classified as waste are solidified filter backwash and sludge from the treatment of river water, failed and broken equipment and tools, air filters, uncontaminated used gloves and other clothing, and certain chemical precipitates such as oxalates. Ash generated at powerhouses in the 200 Areas is buried in designated sites near those powerhouses. Demolition waste from 100 Areas decommissioning projects is buried in situ or in designated sites in the 100 Areas.

Annual reports document the quantities and types of solid waste generated onsite, received, shipped offsite, and disposed of at the Hanford Site (HNF-EP-0125-12). The solid waste program is regulated by the *Resource Conservation and Recovery Act* and *Toxic Substances Control Act*, discussed in Section 2.2, "Compliance Status." Solid waste quantities generated onsite, received from offsite, shipped offsite, and disposed of at the Hanford Site from 1994 through



1999 are shown in Tables 2.5.1 through 2.5.3. Table 2.5.4 provides a detailed summary of the radioactive solid waste stored or disposed of in 1999.

The quantities of liquid waste generated in 1999 and stored in underground storage tanks are

included in the annual dangerous waste report (DOE/RL-2000-14, Rev. 0). Table 2.5.5 is a summary of the liquid waste generated from 1994 through 1999, which are stored in underground storage tanks.

**Table 2.5.1. Quantities of Solid Waste<sup>(a)</sup> Generated on the Hanford Site, kg (lb)**

<b>Waste Category</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>
Mixed	568,000 (1,250,000)	132,000 (291,000)	199,000 (439,000)	442,000 (975,000)	509,000 (1,120,000)	421,000 (928,000)
Radioactive	1,390,000 (3,070,000)	1,890,000 (4,170,000)	3,870,000 (8,530,000)	6,590,000 (14,500,000)	1,470,000 (3,240,000)	957,000 (2,110,000)

(a) Solid waste includes containerized liquid waste.

**Table 2.5.2. Quantities of Solid Waste<sup>(a)</sup> Received from Offsite, kg (lb)**

<b>Waste Category</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>
Mixed	96,000 (212,000)	52,800 (116,000)	2,070 (4,560)	3,560 (7,850)	267 (589)	1,306 (2,880)
Radioactive	1,360,000 (2,990,000)	1,310,000 (2,890,000)	1,670,000 (3,680,000)	1,430,000 (3,150,000)	2,870,000 (6,330,000)	2,325,700 (5,128,000)

(a) Solid waste includes containerized liquid waste. Solid waste quantities do not include United States Navy submarine reactor compartments.



**Table 2.5.3. Quantities of Hazardous Waste<sup>(a)</sup> Shipped Offsite, kg (lb)**

<b>Waste Category</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>
Containerized	267,000 (589,000)	224,000 (494,000)	590,000 (1,300,000)	110,000 (243,000)	65,700 (145,000)	1,732,700 <sup>(b)</sup> (3,820,600)
						70,000 <sup>(c)</sup> (154,000)
Bulk Solids	2,870,000 (6,330,000)	478,000 (1,050,000)	0	335,000 (739,000)	47,500 (105,000)	402,300 <sup>(d)</sup> (887,000)
Bulk Liquids	249,000 (549,000)	130,000 (287,000)	98,800 (218,000)	5,025,000 (11,100,000)	41,800 (92,200)	0
Total	3,386,000 <sup>(e)</sup> (7,470,000)	832,000 (1,840,000)	689,000 (1,520,000)	5,470,000 (12,100,000)	155,000 (342,000)	2,205,000 (4,862,000)

(a) Does not include Toxic Substances Control Act waste.

(b) Hazardous waste only.

(c) Mixed waste (radioactive and hazardous).

(d) Includes 399,875 kg (881,724 lb) from extraction of carbon tetrachloride from soil.

(e) Includes 2,660,000 kg (5,865,300 lb) from Wahluke Slope cleanup and 161,000 kg (355,005 lb) from carbon tetrachloride soil extraction near the Plutonium Finishing Plant, 200-West Area.



**Table 2.5.4. Radioactive Solid Waste Stored or Disposed of on the Hanford Site, 1999**

<b>Constituent<sup>(a)</sup></b>	<b>Quantity, Ci</b>		
	<b>Low Level<sup>(b)</sup></b>	<b>Low-Level Mixed Waste</b>	<b>Transuranic<sup>(c)</sup></b>
Tritium	3,800	170	(c)
Carbon-14	0.098	0.028	(c)
Manganese-54	0.19	0.015	55
Iron-55	36,000	0.21	(c)
Iron-59	0.00000039	0.0048	(c)
Nickel-59	0.006	0.000027	(c)
Cobalt-60	12	0.024	10
Nickel-63	180,000	0.41	(c)
Strontium-90	450	20	860
Yttrium-90	450	20	860
Technetium-99	9	0.91	(c)
Iodine-129	0.000036	0.00024	(c)
Cesium-137	1,100	6.5	2,200
Barium-137m	1,000	6.1	2,100
Thorium-232	0.0029	0.00011	(c)
Uranium-233	0.0014	0.00059	(c)
Uranium-234	0.21	0.0007	(c)
Uranium-235	0.0035	0.025	0.0000022
Uranium-238	0.058	0.43	0.0011
Neptunium-237	0.033	0.00015	0.000086
Plutonium-238	2.3	0.0036	11
Plutonium-239	2.3	0.033	26
Plutonium-240	1.2	0.0085	11
Plutonium-241	87	0.21	390
Plutonium-242	0.0016	0.0000018	0.0064
Americium-241	2.1	0.029	28
Americium-243	0.011	0.0000079	0.0013
Curium-243	0.0013	0.000054	(c)
Curium-244	0.29	0.000076	0.013
Curium-245	0.0000000083	0.0000000042	(c)
Total	220,000	230	6,600

(a) See Table H.5 in the "Helpful Information" section for radionuclide half-lives.

(b) Submarine reactor compartments are mixed waste. Because they are managed as buried waste, the compartments are tabulated under low-level waste.

(c) Contribution was not reported by any waste generator during calendar year 1999.



**Table 2.5.5. Quantities of Liquid Waste<sup>(a)</sup> Generated and Stored Within the Tank Farm System on the Hanford Site in Calendar Year 1999 and in Each of the Previous 5 Calendar Years, L (gal)**

	<b>1994<sup>(a)</sup></b>	<b>1995<sup>(a)</sup></b>	<b>1996<sup>(b)</sup></b>	<b>1997<sup>(b,c)</sup></b>	<b>1998<sup>(b,c)</sup></b>	<b>1999<sup>(b,c)</sup></b>
Volume of waste added to double-shell tanks	10,700,000 (2,827,000)	18,200,000 (4,808,000)	2,420,000 (639,000)	796,000 (210,000)	1,715,000 (453,000)	5,420,000 (1,432,000)
Total volume in double-shell tanks			72,256,000 (19,090,000)	69,245,000 (18,295,000)	70,969,000 (18,750,000)	73,290,000 (19,363,000)
Volume evaporated at 242-A			4,341,000 (1,147,000)	3,800,000 (1,004,000)	0	3,097,000 (818,000)
Volume pumped from single-shell tanks			630,000 (166,000)	244,000 (64,000)	859,000 (227,000)	2,930,000 (774,100)

- (a) Quantity of liquid waste is defined as liquid waste sent to double-shell underground storage tanks during these years. This does not include containerized waste (e.g., barreled) included in the solid waste category.
- (b) Quantity of liquid waste is defined as shown by different categories on left-hand side of table during these years. This does not include containerized waste (e.g., barreled) included in the solid waste category.
- (c) Quantity of liquid waste shown is corrected figure for these years.

## 2.5.2 Chemical Inventories

Types, quantities, and locations of hazardous chemicals are tracked through compliance activities associated with the *Emergency Planning and Community Right-To-Know Act* (see Section 2.2.5). The *1999 Tier Two Emergency and Hazardous Chemical*

*Inventory* (DOE/RL-2000-08) was issued in February 2000 in compliance with Section 312 of the Act. Table 2.5.6 summarizes the information reported, listing the ten chemicals stored in greatest quantity on the Hanford Site in 1999.

**Table 2.5.6. Average Balance of Ten Hazardous Chemicals Stored in Greatest Quantity on the Hanford Site, 1999**

<b>Hazardous Chemical</b>	<b>Average Quantity, kg (lb)</b>
Mineral oil	1,700,000 (3,800,000)
Sodium	1,000,000 (2,300,000)
Diesel fuel (Grades 1 and 2)	500,000 (1,100,000)
Crystalline silica (quartz, cristobalite, tridymite)	450,000 (990,000)
Bentonite	270,000 (600,000)
Ethylene glycol	250,000 (550,000)
Nitrogen	89,000 (200,000)
Argon	73,000 (160,000)
Sulfuric acid	54,000 (120,000)
Propane	38,000 (84,000)