# 2.5 Waste Management

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Waste produced from Hanford Site cleanup operations is classified as either radioactive, non-radioactive, mixed, or dangerous. Radioactive waste is categorized as transuranic, high-level, and low-level. Mixed waste has both radioactive and dangerous non-radioactive substances. Dangerous waste contains hazardous substances. Hanford's dangerous waste is managed in accordance with the state of Washington dangerous waste regulations (WAC 173-303).

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

Approximately 33 Hanford Site generators (as defined in WAC 173-303-040) have the capacity to produce dangerous waste during site cleanup activities. An annual report lists the dangerous waste generated, treated, stored, and disposed of onsite and offsite (DOE/RL-2004-23). Dangerous waste is treated, stored, and prepared for disposal at several Hanford Site facilities or is shipped offsite for disposal or destruction. Some types of dangerous waste, such as used lead acid batteries and used aerosol products, are shipped offsite for recycling.

Non-dangerous waste is waste that does not contain hazardous or radioactive substances. Non-dangerous waste generated at the Hanford Site historically has been buried near the 200 Areas Solid Waste Landfill. Beginning in 1999, non-dangerous waste has been disposed of at the Roosevelt Regional landfill near Goldendale, Washington, through a contract with Basin Disposal, Inc. Since 1996, medical waste has been shipped to Waste Management of Kennewick, Washington. Asbestos has been shipped to Basin Disposal, Inc. in Pasco, Washington, and the onsite Environmental Restoration Disposal Facility. Since 1996, non-regulated drummed waste has been shipped to Waste Management of Kennewick.

Non-dangerous waste originates at a number of areas across the site. Examples include construction debris, office trash, cafeteria waste, and packaging materials. Other materials and items classified as non-dangerous 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. Non-dangerous 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-0125-16). Solid waste program activities are regulated by the *Resource Conservation and Recovery Act* and *Toxic Substances Control Act*, discussed in Section 2.2. Solid waste quantities generated onsite or received from offsite and disposed of at the Hanford Site from 1998 through 2003 are shown in Tables 2.5.1 and 2.5.2. Quantities of dangerous waste shipped offsite from 1998 through 2003 are shown in Table 2.5.3. Table 2.5.4 provides a detailed summary of the radioactive solid waste stored or disposed of in 2003.

The quantities of liquid waste generated in 2003 and stored in underground storage tanks are included in the annual dangerous waste report (DOE/RL-2004-23). Table 2.5.5 is a summary of the liquid waste generated from 1998 through 2003, which are stored in underground storage tanks.

**Table 2.5.1. Quantities of Solid Waste[a] Generated on the Hanford Site, 1998 through 2003, kg (lb)**

| Waste Category | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|
| Mixed | 509,000<br>(1,123,000) | 421,000<br>(928,300) | 441,000<br>(973,500) | 328,500<br>(724,300) | 1,025,200<br>(2,260,600) | 421,000<br>(929,000) |
| Radioactive | 1,470,000<br>(3,230,000) | 957,000<br>(2,109,700) | 700,000<br>(1,544,300) | 1,675,200<br>(3,693,800) | 1,588,000<br>(3,500,900) | 758,000<br>(1,671,000) |

(a) Solid waste includes containerized liquid waste.

**Table 2.5.2. Quantities of Solid Waste[a] Received on the Hanford Site from Offsite Sources, 1998 through 2003, kg (lb)**

| Waste Category | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|
| Mixed | 267<br>(589) | 1,306<br>(2,880) | 1,381<br>(3,045) | 127,000<br>(280,000) | 112,000<br>(246,200) | 667,000[b]<br>(1,470,500) |
| Radioactive | 2,870,000<br>(6,328,400) | 2,325,700<br>(5,128,100) | 6,958,000<br>(15,343,500) | 4,736,500<br>(10,444,100) | 1,517,000<br>(3,345,800) | 407,000<br>(898,200) |

(a) Solid waste contains containerized liquid waste. Solid waste quantities do not include United States Navy reactor compartments.
(b) Total includes Hanford generated waste treated by offsite contractor and returned as newly generated waste.

**Table 2.5.3. Quantities of Dangerous Waste[a] Shipped Off the Hanford Site, 1998 through 2003, kg (lb)**

| Waste Category | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|
| Containerized | 65,700<br>(144,900) | 1,732,700[b]<br>(3,820,700) | 33,200[b]<br>(73,200) | 56,000[b]<br>(124,200) | 78,400[b]<br>(172,900) | 83,500[b]<br>(184,100) |
| | | 70,000[c]<br>(154,300) | 315,500[c]<br>(695,700) | 2,600[c]<br>(5,800) | 3,500[c]<br>(7,800) | 91,800[c]<br>(202,400) |
| Bulk Solids | 47,500<br>(104,700) | 402,300[d]<br>(887,000) | 0 | 0 | 0 | 0 |
| Bulk Liquids | 41,800<br>(92,200) | 0 | 0 | 0 | 50,700<br>(111,700) | 48,400<br>(106,900) |
| **Total** | 155,000<br>(341,800) | 2,205,000<br>(4,862,000) | 348,700<br>(768,900) | 58,600<br>(130,000) | 132,600<br>(292,400) | 223,700<br>(493,400) |

(a) Does not include *Toxic Substances Control Act* waste.
(b) Dangerous waste only.
(c) Mixed waste (radioactive and dangerous).
(d) Includes 399,875 kg (881,724 lb) from extraction of carbon tetrachloride from soil.

**Table 2.5.4. Radioactive Solid Waste Stored or Disposed of on the Hanford Site, 2003**

| Constituent[b,c] | Quantity, Ci[a] Low-Level Waste | Mixed Low-Level Waste | Transuranic Waste |
|---|---|---|---|
| Tritium | 4,780 | 1.4 | (d) |
| Carbon-14 | 12.5 | (d) | (d) |
| Manganese-54 | 3.04 | 0.0219 | (d) |
| Iron-55 | 6,290 | 2,210 | (e) |
| Nickel-59 | 141 | (d) | (d) |
| Cobalt-60 | 6,490 | (d) | 21.5 |
| Nickel-63 | 16,900 | 26,700 | (d) |
| Strontium-90 | 18,300 | 66.6 | 63.0 |
| Yttrium-90 | 18,300 | 66.6 | 63.0 |
| Technetium-99 | 0.0402 | 0.174 | 0.0581 |
| Iodine-129 | 0.0000133 | 0.00953 | 0.00000129 |
| Cesium-137 | 26.7 | 59.7 | 105.0 |
| Barium-137m | 25.2 | 56.5 | 99.8 |
| Uranium-234 | 0.0622 | 0.0123 | 0.00561 |
| Uranium-235 | 0.0031 | 0.000241 | 0.0136 |
| Uranium-236 | 0.0007 | 0.00000703 | 0.0000724 |
| Neptunium-237 | (d) | (d) | 0.00488 |
| Uranium-238 | 0.185 | 0.0108 | 0.399 |
| Plutonium-238 | (d) | (d) | 1,440 |
| Plutonium-239 | (d) | (d) | 10,400 |
| Plutonium-240 | (d) | (d) | 3,980 |
| Plutonium-241 | (d) | (d) | 82,800 |
| Plutonium-242 | (d) | (d) | 2.5 |
| Americium-241 | (d) | (d) | 6,480 |
| Americium-243 | (d) | (d) | 0.0252 |
| Curium-243 | (d) | (d) | 0.0261 |
| Curium-244 | 0.126 | 0.00405 | 3.63 |
| Curium-245 | (d) | (d) | 0.000212 |
| **Total** | 71,300 | 29,200 | 106,000 |

(a) 1 Ci = 37 GBq.
(b) Constituents for which values are given are those that are in abundance, or are otherwise thought to be of interest.
(c) See Appendix A, Table A.7 for radionuclide half-lives.
(d) Value is insignificant relative to other waste types.
(e) No inventory was reported for this waste type.

**Table 2.5.5. Quantities of Liquid Waste[a] Generated and Stored Within the Tank Farm System on the Hanford Site During 2003 and During Each of the Previous 5 Years, L (gal)**

| Type of Waste | 1998[b,c] | 1999[b,c] | 2000[b] | 2001[b] | 2002 | 2003 |
|---|---|---|---|---|---|---|
| Volume of waste added to double-shell tanks | 1,715,000 (453,100) | 5,420,000 (1,432,000) | 8,920,000 (2,357,000) | 2,980,000 (788,000) | 9,280,000 (2,452,000) | 9,710,000 (2,565,000) |
| Total volume in double-shell tanks (year end) | 70,969,000 (18,750,000) | 73,290,000 (19,363,200) | 79,630,000 (21,038,000) | 79,980,000 (21,131,000) | 87,683,000 (23,166,000) | 92,693,000 (24,487,000) |
| Volume evaporated at 242-A evaporator | 0 | -3,097,000 (-818,200) | -2,580,000 (-682,000) | -2,580,000 (-682,000) | -1,578,000 (-417,000) | -4,720,000 (-1,247,000) |
| Volume pumped from single-shell tanks[d] | 859,000 (227,000) | 2,930,000 (774,100) | 2,250,000 (595,000) | 590,000 (155,000) | 5,288,000 (1,397,000) | 6,185,000 (1,634,000) |

(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.
(d) Volume does not include dilution or flush water. 2003 volume includes quantities from both stabilization and retrieval activities.