

Appendix D

Standards and Permits



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Operations at the Hanford Site must conform to a variety of government standards and permits designed to assure the biological and physical quality of the environment for public health, ecological, or aesthetic considerations. The primary environmental quality standards and permits applicable to Hanford Site operations in 2003 are listed in the following tables. The state of Washington has water quality standards for the Columbia River, defined in Washington Administrative Code (WAC) 173-201A. The Hanford Reach of the Columbia River has been designated as Class A (Excellent). This designation requires that the water be usable for substantially all needs, including drinking water, recreation, and wildlife. Class A water standards are summarized in Table D.1. Table D.2 summarizes drinking water standards from the U.S. Environmental Protection Agency (EPA) in the Code of Federal Regulations (40 CFR 141) and WAC 246-290. Select surface freshwater quality criteria for toxic pollutants are included in Table D.3.

Environmental radiation protection standards are published in U.S. Department of Energy (DOE) Order 5400.5. The order establishes limits for public radiation dose and gives guidance to keep radiation exposure to members of the public as low as reasonably achievable. These standards are based on guidelines recommended by authoritative organizations such as the International Commission on Radiological Protection and the National Council on Radiation Protection and Measurements. The DOE initiated a policy to create and implement public radiation protection standards that are generally consistent with the standards used by the U.S. Nuclear Regulatory Commission to regulate and license non-DOE nuclear facilities,

such as nuclear power plants. Table D.4 shows the radiation standards from DOE Order 5400.5, 40 CFR 61, and 40 CFR 141. These standards govern allowable public exposure to ionizing radiation from DOE operations.

DOE Order 5400.5 established derived concentration guides that reflect the concentrations of radionuclides in water and air that an individual could continuously consume, inhale, or be immersed in at average annual levels without exceeding an effective dose equivalent of 100 mrem (1 mSv) per year. Derived concentration guides are not exposure limits but are simply reference values that are provided to allow for comparisons of radionuclide concentrations in environmental media. Table D.5 lists selected DOE derived concentration guides for radionuclides of particular interest at the Hanford Site. The guides are useful reference values but do not generally represent concentrations in the environment that assure compliance with either the DOE, *Clean Air Act*, or drinking water dose standards.

Permits required for regulated releases to water and air have been issued by the EPA under the National Pollutant Discharge Elimination System of the *Clean Water Act* and the “Prevention of Significant Deterioration” requirements of the *Clean Air Act*. Also, under authority granted by the *Clean Air Act*, the Washington State Department of Health issued a permit for Hanford Site radioactive air emissions. Permits to collect wildlife for environmental sampling are issued by the Washington Department of Fish and Wildlife and the U.S. Fish and Wildlife Service. Current permits are discussed in Table D.6.

Table D.1. Washington State Water Quality Standards for the Hanford Reach of the Columbia River^(a)

<u>Parameter</u>	<u>Permissible Levels</u>
Fecal coliform	<ol style="list-style-type: none"> 1) Geometric mean value less than or equal to 100 colonies/100 milliliters (0.026 gallons) 2) Less than or equal to 10% of samples may exceed 200 colonies/100 milliliters (0.026 gallons)
Dissolved oxygen	Greater than 8 mg/L (8 ppm)
Temperature	<ol style="list-style-type: none"> 1) Less than or equal to 18°C (64°F) as a result of human activities 2) When natural conditions exceed 18°C (64°F), no temperature increases will be allowed that will raise the temperature of the receiving water by more than 0.3°C (0.54°F) 3) Incremental temperature increases resulting from point sources shall not at any time exceed $t = 28/(T + 7)$, where t = maximum permissible temperature increase measured at a mixing zone boundary and T = background temperature. Incremental temperature increases resulting from non-point sources shall not exceed 2.8°C (5.04°F)
pH	<ol style="list-style-type: none"> 1) 6.5 to 8.5 range 2) Less than 0.5 unit induced variation
Turbidity	Turbidity shall be less than or equal to 5 nephelometric turbidity units over background turbidity when the background turbidity is 50 nephelometric units or less, and shall not increase more than 10% when the background turbidity is >50 nephelometric units
Toxic, radioactive, or deleterious materials	Concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health
Aesthetic value	Shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste
Radioactive substances	Deleterious concentrations of radioactive materials for all classes shall be as determined by the lowest practicable level attainable and in no case shall exceed 1/12.5 of the values listed in WAC 246-221-290 or exceed EPA drinking water regulations for radionuclides, as published in the Federal Register of July 9, 1976 or subsequent revisions thereto (see Table D.2)
Toxic substances	Shall not be introduced above natural background levels in waters of the state that have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic toxicity to the most sensitive biota dependent on those waters, or adversely affect public health, as determined by the department (see Table D.3)

(a) WAC 173-201A.



Table D.2. Selected Drinking Water Standards

<u>Radiological Constituent</u>	<u>Primary Maximum Contaminant Level</u>	<u>Interim Drinking Water Standard</u>	<u>Agency^(a)</u>	<u>Status</u>
Gross alpha ^(b)	15 pCi/L (0.56 Bq/L)		DOH, ^(c) EPA ^(d)	Final
Beta particle and photon activity	4 mrem/yr (40 μ Sv/yr) ^(e)		DOH, ^(c) EPA ^(d)	Final
Tritium	20,000 ^(f) pCi/L (740 Bq/L)		DOH, ^(c) EPA ^(d)	Final
Beryllium-7		6,000 ^(f) pCi/L (222 Bq/L)	EPA ^(g)	Interim
Cobalt-60		100 ^(f) pCi/L (3.7 Bq/L)	EPA ^(g)	Interim
Strontium-90	8 ^(f) pCi/L (0.296 Bq/L)		DOH, ^(c) EPA ^(d)	Final
Technetium-99		900 ^(f) pCi/L (33.3 Bq/L)	EPA ^(g)	Interim
Ruthenium-106		30 ^(f) pCi/L (1.11 Bq/L)	EPA ^(g)	Interim
Antimony-125		300 ^(f) pCi/L (11.1 Bq/L)	EPA ^(g)	Interim
Iodine-129		1 ^(f) pCi/L (0.037 Bq/L)	EPA ^(g)	Interim
Iodine-131		3 ^(f) pCi/L (0.111 Bq/L)	EPA ^(g)	Interim
Cesium-134		20,000 ^(f) pCi/L (740 Bq/L)	EPA ^(g)	Interim
Cesium-137		200 ^(f) pCi/L (7.4 Bq/L)	EPA ^(g)	Interim
Europium-154		200 ^(f) pCi/L (7.4 Bq/L)	EPA ^(g)	Interim
Europium-155		600 ^(f) pCi/L (22.2 Bq/L)	EPA ^(g)	Interim
Uranium	30 μ g/L (0.03 ppm) ^(h)		EPA ^(d)	Final ⁽ⁱ⁾
Radium-226	20 pCi/L (0.74 Bq/L) ^(d)	3 pCi/L (0.111 Bq/L) ^(c)	DOH, EPA	Final
Radium-226 and -228	5 pCi/L (0.185 Bq/L)		EPA	Final
Fluoride	4 mg/L (4 ppm)		DOH, ^(c) EPA ^(d,i)	Final/under review
Nitrate, as NO ₃	45 mg/L (45 ppm)		DOH, ^(c) EPA ^(d,i)	Final
Chromium	100 μ g/L (0.1 ppm)		DOH, ^(c) EPA ^(d,i)	Final
Cyanide	200 μ g/L (0.2 ppm)		EPA ^(c,d,i)	Final
Trichloroethene	5 μ g/L (0.005 ppm)		DOH, ^(c) EPA ^(d,i)	Final
Tetrachloroethene	5 μ g/L (0.005 ppm)		DOH, ^(c) EPA ^(d,i)	Final
Carbon tetrachloride	5 μ g/L (0.005 ppm)		DOH, ^(c) EPA ^(d,i)	Final
Chloroform (THM) ^(k)	100 μ g/L (0.1 ppm)		DOH, ^(c) EPA ⁽ⁱ⁾	Final
cis-1,2-Dichloroethene	0.07 mg/L (0.07 ppm)		EPA ⁽ⁱ⁾	Final

(a) DOH = Washington State Department of Health; EPA = U.S. Environmental Protection Agency.

(b) Excluding radon and uranium but including radium-226.

(c) WAC 246-290.

(d) 40 CFR 141.

(e) Beta

4 mrem per year.

(f) Activity assumed to yield an annual dose of 4 mrem per year.

(g) EPA-570/9-76-003.

(h) Equivalent to 27 pCi/L (assuming typical uranium natural abundance in rock).

(i) 40 CFR Parts 9, 141, and 142. Final rule promulgated December 7, 2000 (65 FR 76708).

(j) EPA 822-R-96-001.

(k) Standard is for total trihalomethanes (THM).

Table D.3. Selected Surface Freshwater Quality Criteria for Toxic Pollutants

Compound	Level that Yields Acute Toxicity, µg/L (ppm)^(a)	Level that Yields Chronic Toxicity, µg/L (ppm)^(a)	Level to Protect Human Health for the Consumption of Water and Organisms, µg/L (ppm)^(b)
Dissolved Metals			
Antimony	--	--	14 (0.014)
Arsenic	360.0 (0.360)	190.0 (0.19)	0.018 (0.000018)
Cadmium	1.6 (0.0016) ^(c)	0.59 (0.00059) ^(d)	--
Chromium(VI)	16 (0.016)	10 (0.01)	--
Copper	8.4 (0.0084) ^(e)	6.0 (0.006) ^(f)	--
Lead	28 (0.028) ^(g)	1.1 (0.0011) ^(h)	--
Nickel	750 (0.75) ⁽ⁱ⁾	83 (0.083) ^(j)	610 (0.61)
Silver	0.94 (0.00094) ^(k)	--	--
Thallium	--	--	1.7 (0.0017)
Zinc	60 (0.060) ^(l)	55 (0.055) ^(m)	--
Total Recoverable Metals			
Chromium(III) ⁽ⁿ⁾	300 (0.30) ^(o)	96 (0.096) ^(p)	--
Mercury	2.1 (0.0021)	0.012 (0.000012)	0.14 (0.00014)
Selenium	20 (0.02)	5.0 (0.005)	--
Anions			
Cyanide ^(q)	22.0 (0.022)	5.2 (0.0052)	700 (0.70)
Chloride ^(r)	860,000 (860)	230,000 (230)	--
Organic Compounds			
Benzene	--	--	1.2 (0.0012)
Carbon tetrachloride	--	--	0.25 (0.00025)
Chloroform	--	--	5.7 (0.0057)
1,2-Dichloroethane	--	--	0.38 (0.00038)
Methylene chloride	--	--	4.7 (0.0047)
Toluene	--	--	6,800 (6.80)
Tetrachloroethene	--	--	0.8 (0.0008)
1,1,2-Trichloroethane	--	--	0.60 (0.0006)
Trichloroethene	--	--	2.7 (0.0027)
Vinyl chloride	--	--	2 (0.002)
1,4-Dichlorobenzene	--	--	400 (0.40)

(a) WAC 173-201A-040. For hardness dependent criteria, the minimum value of 47 mg CaCO₃/L for 1992-2000 water samples collected near Vernita Bridge by the U.S. Geological Survey is used.

(b) 40 CFR 131.36.

(c) $(1.1017 - [\ln(\text{hardness})]) 0.04184 \exp(1.128[\ln(\text{hardness})]-3.828)$. Hardness expressed as mg CaCO₃/L.

(d) $(1.1017 - [\ln(\text{hardness})]) 0.04184 \exp(0.7852[\ln(\text{hardness})]-3.490)$.

(e) $(0.960) \exp(0.9422[\ln(\text{hardness})]-1.464)$.

(f) $(0.960) \exp(0.8545[\ln(\text{hardness})]-1.465)$.

(g) $(1.4620 - [\ln(\text{hardness})]) 0.1457 \exp(1.273[\ln(\text{hardness})]-1.460)$.

(h) $(1.4620 - [\ln(\text{hardness})]) 0.1457 \exp(1.273[\ln(\text{hardness})]-4.705)$.

(i) $(0.998) \exp(0.8460[\ln(\text{hardness})]+3.3612)$.

(j) $(0.997) \exp(0.8460[\ln(\text{hardness})]+1.1645)$.

(k) $(0.85) \exp(1.72[\ln(\text{hardness})]-6.52)$.

(l) $(0.978) \exp(0.8473[\ln(\text{hardness})]+0.8604)$.

(m) $(0.986) \exp(0.8473[\ln(\text{hardness})]+0.7614)$.

(n) Where methods to measure trivalent chromium are unavailable, these criteria are to be represented by total recoverable chromium.

(o) $(0.316) \exp(0.8190[\ln(\text{hardness})]+3.688)$.

(p) $(0.860) \exp(0.8190[\ln(\text{hardness})]+1.561)$.

(q) Criteria based on weak and dissociable method.

(r) Dissolved in association with sodium.

Table D.4. Radiation Standards (dose limits^(a)) for Protection of the Public from all Routine DOE Concentrations

All Pathways (limits from DOE Order 5400.5)

The effective dose equivalent for any member of the public from all routine DOE operations^(b) shall not exceed the values given below.

	Effective Dose Equivalent ^(c)	
	mrem/yr	mSv/yr
Routine public dose	100	1
Potential authorized temporary public dose ^(d)	500	5

Dose to Native Aquatic Animal Organisms from Liquid Discharges (interim limits from DOE Order 5400.5)

Radioactive material in liquid waste discharged to natural waterways shall not cause an absorbed dose^(e) to native aquatic animal organisms that exceeds 1 rad (10 mGy) per day.

Drinking Water Pathway Only (limits from 40 CFR Parts 9, 141, and 142; WAC 246-290; and DOE Order 5400.5)

Radionuclide concentrations in DOE-operated public drinking water supplies shall not cause persons consuming the water to receive an effective dose equivalent greater than 4 mrem (0.04 mSv) per year. DOE operations shall not cause private or public drinking water systems downstream of the facility discharge to exceed the radiological drinking water limits in 40 CFR Parts 9, 141, and 142 (see Table D.2).

Air Pathways Only (limits from 40 CFR 61)

	Effective Dose Equivalent ^(c)	
	mrem/yr	mSv/yr
Public dose limit at location of maximum annual air concentration as a consequence of routine DOE operations ^(b)	10	0.1

- (a) Radiation doses received from natural background, residual weapons testing and nuclear accident fallout, medical exposure, and consumer products are excluded from the implementation of these dose limits.
- (b) "Routine DOE operations" implies normal, planned activities and does not include actual or potential accidental or unplanned releases.
- (c) Effective dose equivalent is expressed in rem (or millirem) and sievert (or millisievert).
- (d) Authorized temporary annual dose limits may be greater than 100 mrem (1 mSv) per year (but cannot exceed 500 mrem [5 mSv]) per year if unusual circumstances exist that make avoidance of doses greater than 100 mrem (1 mSv) per year to the public impracticable. DOE Richland Operations Office is required to request and receive specific authorization from DOE Headquarters for an increase from the routine public dose limit to a temporary annual dose limit.
- (e) Absorbed dose is expressed in rad (or millirad) with the corresponding value in gray (or milligray) in parentheses.

Table D.5. Selected DOE Derived Concentration Guides^(a,b,c)

<u>Radionuclide</u>	<u>Ingested Water,</u>		<u>Inhaled Air,</u>	
	<u>pCi/L (Bq/L)</u>		<u>pCi/m³ (Bq/m³)</u>	
Tritium	2,000,000	(74,000)	100,000	(3,700)
Carbon-14	70,000	(2,590)	500,000	(18,500)
Chromium-51	1,000,000	(37,000)	60,000	(2,220)
Cobalt-60	5,000	(185)	80	(2.96)
Strontium-90	1,000	(37)	9	(0.333)
Technetium-99	100,000	(3,700)	2,000	(74)
Ruthenium-103	50,000	(1,850)	2,000	(74)
Ruthenium-106	6,000	(222)	30	(1.11)
Iodine-129	500	(18.5)	70	(2.59)
Iodine-131	3,000	(111)	400	(14.8)
Cesium-137	3,000	(111)	400	(14.8)
Uranium-234	500	(18.5)	0.09	(0.00333)
Uranium-235	600	(22.2)	0.1	(0.0037)
Uranium-238	600	(22.2)	0.1	(0.0037)
Plutonium-238	40	(1.48)	0.03	(0.00111)
Plutonium-239	30	(1.11)	0.02	(0.00074)
Plutonium-240	30	(1.11)	0.02	(0.00074)
Americium-241	30	(1.11)	0.02	(0.00074)

- (a) Concentration of a specific radionuclide in water or air that could be continuously consumed or inhaled at average annual rates and not exceed an effective dose equivalent of 100 mrem (1 mSv) per year.
- (b) Values in this table represent the lowest, most-conservative, derived concentration guides considered potentially applicable to Hanford Site operations and may be adjusted upward (larger) if accurate solubility information is available.
- (c) From DOE Order 5400.5.

Table D.6. Environmental Permits

Clean Air Act Permits

Prevention of Significant Deterioration Permit No. PSD-X80-14, issued to DOE Richland Operations Office by EPA Region 10; covers emission of NO_x to the atmosphere from the Plutonium-Uranium Extraction Plant and the Uranium-TriOxide Plant. No expiration date.

Hanford Site Air Operating Permit 00-05-006 covers operations on the Hanford Site having a potential to emit airborne emissions. Effective July 2, 2001, expires July 1, 2006. The permit is intended to provide a compilation of applicable *Clean Air Act* requirements both for radioactive and non-radioactive emissions at the Hanford Site. It will be implemented through federal and state programs.

State License FF-01 was incorporated into the Hanford Site air operating permit.

Clean Water Act – National Pollutant Discharge Elimination System Permits

Permit WA-002591-7 (governing effluent discharges to the Columbia River) includes the outfall for the 300 Area Treated Effluent Disposal Facility and two outfalls in the 100-K Area.

Permit WAR05A57E, issued May 30, 2001, governs storm water discharges.

Permit CR-IU005 allows wastewater from the Environmental and Molecular Sciences Laboratory to be discharged to the city of Richland's wastewater treatment facility.

Washington State Department of Ecology – State Wastewater Permits

Permit ST 4500 allows treated wastewater from the Effluent Treatment Facility to be discharged to the State-Approved Land Disposal Site. Expires August 1, 2005.

Permit ST 4501 allows for the discharge of cooling water and other primarily uncontaminated wastewater from 400 Area

has been submitted. A new permit was issued on September 10, 2003, and was effective on October 1, 2003.

Permit ST 4502 allows treated effluent from the 200-East and 200-West Areas to be discharged to the 200 Area Treated Effluent Disposal Facility. Expires May 2005.

Permit ST 4507 allows domestic wastewater to be discharged to the 100-N Area sewage lagoon. Permit expired in May 2002. A renewal application has been submitted.

Permit ST 4508 allows for the discharge of wastewater associated with hydrotesting, maintenance, and construction activities under specific conditions. Expired May 30, 2002.

Permit ST 4509 allows for cooling water, condensate discharges, and miscellaneous discharges from pump leaks, valve wastewater, and tank overflows under controlled conditions. Expired May 1, 2003. An application has been submitted to combine Permits 4508, 4509, and 4510 into a single permit. This combined permit (ST 4511) is expected to be issued in 2004.

Permit ST 4510 covers wastewater discharges associated with industrial storm water under controlled conditions. Expired April 1, 2004.

Permit WAG-50-5180 (General Sand and Gravel) for the Concrete Batch Plant in the 200-East Area.

Permit WAG-50-5181 for Gravel Pit 30 in the 200-East Area.

Permit ST 9240 is a one time limited duration discharge permit (per request) in support of higher volume Waste Treatment Plant construction discharges.

Wildlife Sampling Permits

Scientific Collection Permit 03-029, issued by Washington Department of Fish and Wildlife to Pacific Northwest National Laboratory for 2003; covered the collection of food fish, shellfish, and wildlife, including game fish, for environmental monitoring purposes. Renewed annually.

Federal Fish and Wildlife Permit No. MB671877-0, issued by the U.S. Fish and Wildlife Service to Pacific Northwest National Laboratory; covers the collection of migratory wildlife. Expires March 31, 2006.

Copies of the regulations concerning these permits may be obtained from the following organizations:

State of Washington	U.S. Environmental Protection Agency	U.S. Department of Energy
Department of Ecology	Region 10	Richland Operations Office
P.O. Box 47600	1200 Sixth Avenue	825 Jadwin Avenue
Olympia, WA 92504-7600	Seattle, WA 98101	Richland, WA 99352

References

40 CFR 61. U.S. Environmental Protection Agency. "National Emission Standards for Hazardous Air Pollutants." *U.S. Code of Federal Regulations*.

40 CFR 131.36. U.S. Environmental Protection Agency. "Toxics Criteria for Those States not Complying with the Clean Water Act Section 303(c)(2)(B)." *U.S. Code of Federal Regulations*.

40 CFR 141. U.S. Environmental Protection Agency. "National Primary Drinking Water Regulations." *U.S. Code of Federal Regulations*.

40 CFR Parts 9, 141, and 142. U.S. Environmental Protection Agency. "National Primary Drinking Water Regulations; Radionuclides; Final Rule." *U.S. Code of Federal Regulations*. 65 FR 76708, December 7, 2000.

Clean Air Act. 1986. Public Law 88-206, as amended, 42 USC 7401 et seq.

Clean Water Act. 1977. Public Law 95-217, as amended, 91 Stat. 1566 and Public Law 96-148, as amended.

DOE Order 5400.5. "Radiation Protection of the Public and the Environment."

EPA-570/9-76-003. 1976. *National Interim Primary Drinking Water Regulations*. Office of Water Supply, U.S. Environmental Protection Agency, Washington, D.C.

EPA 822-R-96-001. 1996. *Drinking Water Regulations and Health Advisories*. Office of Water, U.S. Environmental Protection Agency, Washington, D.C.

WAC 173-201A. "Water Quality Standards for Surface Waters of the State of Washington." Washington Administrative Code, Olympia, Washington.

WAC 173-201A-040. "Toxic Substances." Washington Administrative Code, Olympia, Washington.

WAC 246-221-290. "Appendix A - Annual Limits on Intake (ALI) and Derived Air Concentrations (DAC) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sanitary Sewerage." Washington Administrative Code, Olympia, Washington.

WAC 246-290. "Group A Public Water Systems." Washington Administrative Code, Olympia, Washington.

