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EXECUTIVE SUMMARY

This report fulfills the annual reporting requirements of U.S. Department of Energy (DOE) Order 5400.1, *General Environmental Protection Program*. Presented in the report are tabular data summaries on air emissions and liquid effluents released to the environment as well as nonroutine releases during calendar year (CY) 1999. These releases, bearing radioactive and hazardous substances, were from facilities and activities managed by Bechtel Hanford, Inc. (BHI), CH2M HILL Hanford Group, Inc. (CHG), and Fluor Hanford (FH). These data were obtained from direct sampling and analysis and from estimates based upon approved release factors.

This report further serves as a supplemental resource to the *Hanford Site Environmental Report* (HSER; PNNL–13230), published by the Pacific Northwest National Laboratory. A yearly accounting is given in HSER of the impacts that major activities at the Hanford Site have had on the surrounding populace and environment. The regulatory compliance status of the Hanford Site is also summarized in HSER.

Comprehensive data summaries of air emissions and liquid effluents released during CY 1999 are displayed in Tables ES–1 through ES-5, which represent the following:

- Radionuclide air emissions (refer to Table ES-1; detailed data are in Section 2.0)
- Radionuclides in liquid effluents discharged to ground (refer to Table ES-2; detailed data are in Section 3.0)
- Radionuclides discharged to the Columbia River (refer to Table ES-3; detailed data are in Section 3.0)
- Nonradioactive air emissions (refer to Table ES-4; detailed data are in Section 2.0)
- Total volumes and flow rates of radioactive liquid effluents discharged to ground (refer to Table ES-5; detailed data are in Section 3.0).

Table ES–1. Radionuclide Air Emissions from Facilities Managed by BHI, CHG, and FH During 1999.

Radionuclide	Release (Ci)[a]
^{3}H (HT)[b]	ND
^{3}H (HTO)[b]	1.5 E+00
^{60}Co	4.1 E–08
^{90}Sr	4.3 E–04
^{106}Ru	ND
^{125}Sb	1.6 E–07
^{129}I	1.9 E–04
^{134}Cs	ND
^{137}Cs	8.6 E–05
^{152}Eu	ND
^{154}Eu	4.8 E–08
^{238}Pu	5.5 E–06
$^{239,240}Pu$	2.2 E–04
^{241}Pu	1.7 E–04
^{241}Am	4.8 E–05

[a] 1 curie = 3.7 E+10 becquerels; ND = not detected (that is, either the radionuclide was not detected in any sample during the year or the average of all the measurements for that given radionuclide or type of radioactivity made during the year was below background levels; takes into account that sampling and analyzing for this radionuclide in some areas is not required because of its minor significance [<10%] to the overall dose potential from that particular emission point).

[b] HTO = tritiated water; HT = tritium gas.

Table ES-2. Radionuclides in Liquid Effluents Discharged to State-Approved Land Disposal Site[a] Managed by FH During 1999.

Radionuclide	Release (Ci)[b]
^{3}H	9.0 E+00
^{90}Sr	1.7 E–04
^{99}Tc	ND
^{106}Ru	ND
^{125}Sb	ND
^{129}I	ND
^{134}Cs	ND
^{137}Cs	ND
^{226}Ra	ND
^{237}Np	7.0 E–06
^{238}Pu	2.2 E–06
$^{239,240}Pu$	9.4 E–06
^{241}Am	5.5 E–06
^{244}Cm	ND

[a] The State-Approved Land Disposal Site is also known as the 616 Crib, which is located in the 600 Area north of the 200 West Area.

[b] 1 curie = 3.7 E+10 becquerels; ND = not detected (that is, either the radionuclide was not detected in any sample during the year or the average of all the measurements for that given radionuclide or type of radioactivity made during the year was below background levels).

Table ES-3. Radionuclides in Liquid Effluents Discharged to the Columbia River from Facilities Managed by BHI and FH During 1999.

Radionuclide	Release (Ci)[a]
^{3}H	ND
^{60}Co	ND
^{90}Sr	7.7 E–03
^{125}Sb	ND
^{134}Cs	ND
^{137}Cs	ND
^{238}Pu	ND
$^{239,240}Pu$	1.5 E–05
^{241}Am	1.6 E–05

[a] 1 curie = 3.7 E+10 becquerels; ND = not detected (that is, either the radionuclide was not detected in any sample during the year or the average of all the measurements for that given radionuclide or type of radioactivity made during the year was below background levels).

Table ES-4. Nonradioactive Constituents in Air Emissions from Facilities Managed by CHG and FH During 1999.

Constituent	Quantities (kg)
Particles (PM_{10} and $PM_{2.5}$[a])	1.5 E+03
Sulfur oxides (SO_x)	3.4 E+03
Nitrogen oxides (NO_x)	2.7 E+04
Carbon monoxide (CO)	2.9 E+04
Volatile organic compounds	7.5 E+03
Ammonia	9.8 E+03
Lead	0
Toxic air pollutants	4.1 E+03

[a] PM = particulate matter; PM_{10} and $PM_{2.5}$ refer to particle diameters, which are, respectively, 10 μm and 2.5 μm.

Table ES-5. Total Volumes and Flow Rates of Radioactive Liquid Effluents Discharged to State-Approved Land Disposal Site Managed by FH During 1998 and 1999.[a]

Stream code[b]	EDP code[c]	Effluent source	Disposal site	Volume, gal (L)[d]		Average flow rate, gpm (Lpm)	
				1998	1999	1998	1999
ETF	H129	200 Area Effluent Treatment Facility	616-A Crib	2.8 E+07 (1.1 E+08)	2.3 E+07 (8.8 E+07)	53 (200)	44 (170)

[a] These discharges do not include discharges to the 200 East Area Treated Effluent Disposal Facility (TEDF) because they meet drinking water standards.
[b] Stream code represents the specific liquid effluent source, which in this case is the 200 Area Effluent Treatment Facility (ETF).
[c] EDP code = electronic data processing code.
[d] 1 gal = 3.785 L.

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GLOSSARY

BHI	Bechtel Hanford, Incorporated
Bq	becquerel
Ci	curie
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	Code of Federal Regulations
CHG	CH2M HILL Hanford Group, Inc.
DCG	derived concentration guide
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
Ecology	State of Washington Department of Ecology
EDE	effective dose equivalent
EDP Code	electronic data processing code
EP	external publication
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESPC	energy savings performance contract
ETF	Effluent Treatment Facility
FH	Fluor Hanford
FFTF	Fast Flux Test Facility
ft^3	cubic foot
HEPA	high-efficiency particulate air (filter)
HT	tritium gas
HTO	tritiated water
L	liter
LWDF	Liquid Waste Disposal Facility
m^3	cubic meter
MASF	Maintenance and Storage Facility
MEI	maximally exposed individual
μCi	microcurie
μSv	microsievert
ml	milliliter
mrem	millirem (unit of dose)
ND	not detected
NPDES	National Pollutant Discharge Elimination System
pCi	picocurie
PHMC	Project Hanford Management Contract
PFP	Plutonium Finishing Plant
PSD	Prevention of Significant Deterioration
PNNL	Pacific Northwest National Laboratory
POTW	publicly owned treatment works
ppm	parts per million
PUREX	plutonium-uranium extraction
RCRA	*Resource Conservation and Recovery Act of 1976*
REDOX	reduction-oxidation

GLOSSARY (cont)

RQ	reportable quantity
SALDS	State-Approved Land Disposal Site
TEDF	Treated Effluent Disposal Facility
TRIGA	Test Reactor and Isotope Production, General Atomics
TRU	transuranic
TRUSAF	224-T Transuranic Waste Storage and Assay Facility
UO_3	uranium trioxide
SALDS	State-Approved Land Disposal Site
TEDF	Treated Effluent Disposal Facility
TRIGA	Test Reactor and Isotope Production, General Atomics
TRU	transuranic
TRUSAF	224-T Transuranic Waste Storage and Assay Facility
UO_3	uranium trioxide
WAC	Washington Administrative Code
WDOH	Washington State Department of Health
WESF	Waste Encapsulation Storage Facility
WMH	Waste Management Federal Services of Hanford, Incorporated
WPPSS	Washington Public Power Supply System
WSCF	Waste Sampling and Characterization Facility

ENVIRONMENTAL RELEASES FOR CALENDAR YEAR 1999

1.0 INTRODUCTION

Bechtel Hanford, Inc. (BHI), CH2M HILL Hanford Group, Inc. (CHG), and Fluor Hanford (FH) are responsible for monitoring radioactive and nonradioactive material in air emissions and liquid effluents released into the environment from U.S. Department of Energy (DOE) facilities and activities that they manage on the Hanford Site. This report documents releases during 1999, thereby fulfilling the annual reporting requirements of DOE Order 5400.1. Release data are presented both in summary and in detailed tabular forms.

The report also supplements information in the *Hanford Site Environmental Report for Calendar Year 1999* (HSER; PNNL–13230), published by Battelle's Pacific Northwest National Laboratory (PNNL). In HSER is a public accounting of activities on the Hanford Site that affect the environment, as well as a summary of the status of Hanford Site compliance with environmental regulations.

1.1 TYPES AND LOCATIONS OF RELEASES

Radioactive air emissions were released in 1999 from activities and from facilities in the 100, 200, 300, 400, and 600 Areas of the Hanford Site. Radioactive liquid effluents were discharged to the soil in the 600 Area and to the Columbia River along the riverbank bordering the 100-K and 100-N Areas.

Major sources of nonradioactive air emissions of industrial origin are (1) fossil-fuel combustion emissions from the operation of package boilers and portable generators and (2) emissions of nitrogen oxides, ammonia, and volatile organic compounds from the 242-A Evaporator, the 200 Area Effluent Treatment Facility (ETF), and tanks containing radioactive liquid waste. Most of these sources are located in the 200 and 300 Areas.

Nonradioactive wastewater in the 200 Area is sent to the 200 Area Treated Effluent Disposal Facility (TEDF) for discharge to ground by way of two percolation basins. Radioactive wastewater from many Hanford Site sources is treated at ETF and then discharged to ground at the State Approved Land Disposal Site (SALDS). Wastewater generated in the 300 Area is sent to the 300 Area Treated Effluent Disposal Facility (TEDF) for treatment before being discharged to the Columbia River via a regulated outfall. The 100-N Sewage Treatment Lagoon receives sanitary wastewater from 100-N facilities and from failed septic systems in the 100-K and 200 Areas, the wastewater from which is collected in and delivered by tanker trucks. Sanitary wastewater in the 100-DR and 100-K Areas is discharged into septic tanks or to drain fields. In the 200 Areas, sanitary wastewater is discharged to several septic tanks or subsurface disposal systems located there. Sanitary wastewater in the 300 Areas is discharged to the city of Richland's publicly owned treatment works (POTW). Sanitary wastewater in the 400 Area is discharged to the Washington Public Power Supply System (WPPSS) sewage treatment plant.

1.2 ENVIRONMENTAL RELEASE LIMITS AND GUIDELINES

This section presents relevant environmental release standards for radiological and nonradiological constituents. These standards are applicable when they (1) affect the release and transport of constituents, (2) are important toward the meeting of any issued federal, state, or local permit, or (3) are necessary to meet any federal, state, local regulations, or guidelines prescribed by the U.S. Department of Energy, Richland Operations Office (DOE-RL).

1.2.1 Limits for Radioactive Releases

Quantities of radionuclides in air emissions and liquid effluents from the Hanford Site are governed by DOE Order 5400.5, *Radiation Protection of the Public and the Environment*. Quantities of radionuclides in air emissions are regulated by Title 40 of the Code of Federal Regulations (CFR) Part 61, Subpart H, and by the Washington Administrative Code (WAC) Chapter 246-247. The effective dose equivalent (EDE) received by any member of the offsite public from all effluents and emissions released during routine operations on the Hanford Site is not to exceed 100 mrem/yr (1 mSv/yr). For occasional exposure from noncontinuous releases, the EDE is not to exceed 500 mrem/yr (5 mSv/yr). From the air pathway only, the EDE to any member of the public is not to exceed 10 mrem/yr (0.1 mSv/yr). The derived concentration guide (DCG) values in DOE Order 5400.5 apply to any potentially exposed member of the public. DCG values are not limits, and therefore are used for comparison purposes only.

The 300 Area TEDF is regulated by an aquatic-lands sewer outfall lease (Lease Number 20–012257) from the U.S. Department of Natural Resources. Limits for radioactive constituents include 15 pCi/L (5.5 E+02 Bq/m^3) alpha, 50 pCi/L (1.9 E+03 Bq/m^3) beta, and 20,000 pCi/L (7.4 E+05 Bq/m^3) tritium.

HSER contains an assessment, performed by PNNL, of the radiological impacts to the public that result from Hanford Site operations, in accordance with DOE Orders 5400.1, 5400.5, and 5480.1B. Effluent data in this report (that is, HNF-EP–0527-9) and in the *Radionuclide Air Emissions Report for the Hanford Site Calendar Year 1999* (DOE/RL-2000-37) were used by PNNL to estimate offsite radiological doses. These data and related compliance determinations to federal and state dose standards are also published in HSER.

1.2.2 Limits for Nonradioactive Releases

The following regulations, as applicable, govern nonradioactive constituents in air emissions and liquid effluents: *Clean Water Act of 1977, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980; Resource Conservation and Recovery Act (RCRA) of 1976; Safe Drinking Water Act of 1974; Toxic Substances Control Act of 1976;* the State of Washington regulations WAC 173-216, 173-218, 173-272, 173-303, 173-400, and 173-460; and the Benton County Clean Air Authority *Regulation 1*.

Liquid effluent discharges to ground at the Hanford Site are permitted by the Washington State Department of Ecology (Ecology). Monitoring, sampling, and analysis parameters for as well as release limits on specific constituents are defined in discharge permits issued by Ecology.

Liquid effluent streams discharging to the Columbia River must comply with the regulations of the National Pollutant Discharge Elimination System. Monitoring, sampling, and analysis parameters for as well as release limits on specific constituents are defined in discharge permits issued by the U.S. Environmental Protection Agency (EPA).

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2.0 AIR EMISSIONS

During 1999, radioactive and nonradioactive air emissions were released to the atmosphere from activities and facilities and managed by BHI, CHG, and FH. Release data for each type of emission are discussed separately.

2.1 RADIONUCLIDE AIR EMISSIONS

Radionuclide air emissions from actively ventilated point sources (that is, emissions forcibly discharged, usually, through stacks or vents by the use of exhaust fans) having a potential to emit radioactive material to the atmosphere are routinely monitored. In the 200 Areas, stacks and vents are designated by a number that has a "291" or "296" prefix, depending on stack height. The "291" prefix is used exclusively for stacks that are 200 ft (61 m) high, and the "296" prefix is used for all other, and shorter, stacks and vents. In the 100, 300, and 400 Areas, stacks and vents usually identified by the facility at which they are located. Stacks in the 600 Area have the prefix of "696."

Radionuclide air emissions from sources other than actively ventilated point sources are monitored as diffuse and fugitive emissions. An exception to diffuse and fugitive sources is the passively vented point source, examples of which include the retired HEPA filters at B Plant (stack 296-B-2) and single-shell tank vents. Diffuse and fugitive emissions are monitored collectively by the Near-Facility Monitoring Program and the Environmental Surveillance Program. Monitoring data from these sources are not presented in this report but are available in the *Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 1999* (DOE/RL-2000-37), the *Hanford Site Environmental Monitoring Report for Calendar Year 1999* (PNNL–13230), and the *Hanford Site Near-Facility Environmental Monitoring Data Report for Calendar Year 1999* (PNNL–13230, APP. 2).

2.1.1 Mitigation of Radionuclide Air Emissions

The following are examples of methods used to remove radionuclides from air emissions: (1) high-efficiency particulate air (HEPA) filters, (2) sand filters, (3) charcoal absorbers (for iodine removal), (4) water scrubbers, (5) deep-bed fiberglass filters, and (6) fiberglass prefilters. Generally at least one stage of HEPA filtration is used as the final particulate removal method before air is discharged to the atmosphere. All in-place HEPA filters are required to have an efficiency of ≥99.95% in removing airborne particles with a median aerodynamic-equivalent diameter of 0.3 μm. This level of efficiency is assured by routine testing of the HEPA filters. These filtration systems have proven effective at mitigating Hanford Site radioactive emissions, as indicated by release data showing radionuclides in many cases at concentrations near or below the lowest limits of analytical detection.

2.1.2 Radionuclide Air Emissions Data

Release data on radionuclide air emissions from facilities, by operating area, are in Table 2-1. Tables 2-2 and 2-3 present data on radionuclide air emissions from individual stacks and vents. These data include average concentrations and total activities of radionuclides and types of radioactivity measured.

Emissions from actively ventilated point sources are documented in this report when the following criteria were met during 1999: (1) the point source requires continuous monitoring or periodic confirmatory measurements in accordance with 40 CFR 61, Subpart H, or with WAC 246-247, (2) the point source is registered with WDOH, and (3) the point source normally has or potentially could have radionuclide emissions. Point sources not included in this section either did not meet those criteria or their air emissions were not forcibly discharged because, for example, these sources became passively ventilated or were sealed off or deactivated. Air emissions forcibly discharged by exhaust fans were sampled only if radioactive material had a potential of being released.

2.2 NONRADIOACTIVE AIR EMISSIONS

In 1999, nonradioactive air emissions were discharged from the following facilities: East Tank Farms; West Tank Farms, 242-A Evaporator; ETF, and package boilers in the 200 and 300 Areas. Emission data on these sources are in Table 2-4.

Package boiler emissions were estimated using information on the type and quantity of fuel consumed and by applying formulas approved by the EPA (EPA 450/4-90–003). Table 2-5 gives a summary of the type and quantity of fuel consumed by the package boilers.

Table 2–1. Radionuclide Air Emissions from Facilities Managed by BHI, CHG, and FH During 1999.

Radionuclide	Release, Ci[a]					
	100 Area	200 East Area	200 West Area	300 Area	400 Area	Total
^{3}H (as HT)	NM	NM	NM	ND	ND	ND
^{3}H (as HTO)	NM	NM	NM	1.3 E–01	1.4 E+00	1.5 E+00
^{60}Co	3.9 E–08	1.6 E–09	ND	ND	NM	4.1 E–08
^{90}Sr	1.9 E–05[b]	9.6 E–05[b]	2.9 E–04[b]	3.0 E–06[b]	NM	4.3 E–04[b]
^{106}Ru	ND	ND	NM	ND	NM	ND
^{125}Sb	5.0 E–08	ND	NM	1.1 E–07	NM	1.6 E–07
^{129}I	NM	1.9 E–04	NM	NM	NM	1.9 E–04
^{134}Cs	ND	ND	ND	ND	NM	ND
^{137}Cs	4.5 E–05	3.9 E–05	2.5 E–09	4.2 E–07	1.9 E–06[c]	8.6 E–05[c]
^{154}Eu	4.8 E–08	ND	ND	ND	NM	4.8 E–08
^{238}Pu	5.8 E–07	1.9 E–08	4.9 E–06	ND	NM	5.5 E–06
$^{239,240}Pu$	4.2 E–06[d]	6.9 E–07[d]	2.1 E–04[d]	1.6 E–07[d]	3.0 E–07[d]	2.2 E–04[d]
^{241}Pu	5.1 E–05	1.2 E–06	1.2 E–04	NM	NM	1.7 E–04
^{241}Am	2.4 E–06	5.6 E–07	4.5 E–05	1.3 E–07	NM	4.8 E–05

[a] Ci = curie; 1 Ci = 3.7 E+10 becquerels (Bq); ND = not detected (that is, either the radionuclide was not detected in any sample during the year or the average of all the measurements for that given radionuclide or type of radioactivity made during the year was below background levels); NM = not measured, because this nuclide does not present a significant estimated contribution (that is, >10%) to the offsite dose potential.

[b] This value includes total beta release data, which are assumed to be ^{90}Sr for dose calculations.

[c] This value includes total beta release data, which are assumed to be ^{137}Cs for dose calculations.

[d] This value includes total alpha release data, which are assumed to be $^{239,240}Pu$ for dose calculations.

Table 2-2. Radionuclide Air Emissions from Major Point Sources at Facilities Managed by BHI, CHG, and FH During 1999.
(major point sources have the potential of >0.1 mrem/yr EDE to nearest offsite resident)[a] (4 sheets)

Source[b] (Facility, Contractor, EDP code)	Discharge height, ft (m)	Emission control[c] (stages)	Total flow, ft^3 (m^3)	Radionuclide or type of radioactivity[d]	Average concentration, μCi/ml[e]	Annual emissions, Ci[e]
200 East Area Point Sources						
291-A–1 (PUREX, BHI, A552)	200 (61)	HEPA (3)	4.2 E+09 (1.2 E+08)	^{90}Sr ^{106}Ru ^{125}Sb ^{129}I ^{134}Cs ^{137}Cs ^{238}Pu ^{239,240}Pu ^{241}Pu ^{241}Am	5.1 E–15 ND ND 1.4 E–12 ND 1.3 E–14 8.3 E–17 1.3 E–15 5.1 E–15 2.4 E–15	1.2 E–06 ND ND 1.9 E–04 ND 2.9 E–06 1.9 E–08 3.0 E–07 1.2 E–06 5.4E–07
296-B–1 (B Plant, FH, B001)	90 (27.4)	HEPA (2)	6.8 E+09 (1.9 E+08)	^{90}Sr ^{125}Sb ^{134}Cs ^{137}Cs ^{239,240}Pu ^{241}Am	7.8 E–16 ND ND ND 1.8 E–17 4.6 E–17	1.5 E–07 ND ND ND 3.5 E–09 9.0 E–09
296-B–10 (WESF, FH, B748)	75 (22.9)	HEPA (2)	1.1 E+10 (3.0 E+08)	^{90}Sr ^{125}Sb ^{134}Cs ^{137}Cs total α	2.4 E–13 ND ND 8.9 E–14 1.1 E–15	9.2 E–05 ND ND 3.4 E–05 4.1 E–07
296-A–12 (East Tank Farms, CHG, E058)	closed and deregistered as of 10/29/99					
296-A–17 *backup: 296-P-26* (East Tank Farms, CHG E059 and *E039*)	deactivated					
296-A-25 (East Tank Farms, CHG, E080)	9.8 (3.0)	HEPA (2)	4.0 E+07 (1.1 E+06)	^{90}Sr ^{134}Cs ^{137}Cs ^{238}Pu ^{239,240}Pu ^{241}Am	2.5 E–15 ND 5.4 E–13 ND 3.8 E–17 2.2 E–17	3.6 E–09 ND 7.6 E–07 ND 5.3 E–11 3.0 E–11
296-A-42 (East Tank Farms, CHG, E147)	55 (16.8)	HEPA (2)	4.7 E+08 (1.3 E+07)	^{90}Sr ^{137}Cs ^{239,240}Pu ^{241}Am total β	7.9 E–16 ND 2.0 E–17 2.3 E–17 5.6 E–15	1.4 E–08 ND 3.7 E–10 4.2 E–10 1.1 E–07

Table 2-2. Radionuclide Air Emissions from Major Point Sources at Facilities Managed by BHI, CHG, and FH During 1999.
(major point sources have the potential of >0.1 mrem/yr EDE to nearest offsite resident)[a] (4 sheets)

Source[b] (Facility, Contractor, EDP code)	Discharge height, ft (m)	Emission control[c] (stages)	Total flow, ft^3 (m^3)	Radionuclide or type of radioactivity[d]	Average concentration, μCi/ml[e]	Annual emissions, Ci[e]
296-B-28 (West Tank Farms, CHG, E886)	11 (3.4)	HEPA (2)	7.8 E+07 (2.2 E+06)	^{90}Sr ^{134}Cs ^{137}Cs ^{238}Pu ^{239,240}Pu ^{241}Am	1.4 E–15 ND ND ND 4.5 E–17 8.8 E–17	4.3 E–09 ND ND ND 1.4 E–10 2.7 E–10
296-C-5 (East Tank Farms, CHG, E069)	48 (14.6)	HEPA (2)	1.9 E+09 (5.4 E+07)	^{90}Sr ^{137}Cs ^{238}Pu ^{239,240}Pu ^{241}Am	1.6 E–15 1.9 E–15 ND 1.3 E–17 3.2 E–17	1.0 E–07 1.3 E–07 ND 8.5 E–10 2.1 E–09
296-C-6 (East Tank Farms, CHG, E083)	18.7 (5.7)	HEPA (2)	3.8 E+07 (1.1 E+06)	^{60}Co ^{90}Sr ^{137}Cs ^{239,240}Pu ^{241}Am	1.1 E–15 7.4 E–16 ND 3.6 E–17 1.7 E–16	1.6 E–09 1.1 E–09 ND 5.3 E–10 2.5 E–10
296-P–16 (East Tank Farms, CHG, E068)	15 (4.6)	HEPA (2)	1.2 E+09 (3.5 E+07)	^{90}Sr ^{134}Cs ^{137}Cs ^{238}Pu ^{239,240}Pu ^{241}Am	1.8 E–14 ND 2.1 E–14 ND 3.0 E–17 1.0 E–16	2.4 E–07 ND 8.2 E–07 ND 1.1 E–09 3.9 E–09
296-P-32 (East Tank Farms, CHG, E401)	15 (4.6)	HEPA (2)	did not operate			
296-P-33 (East Tank Farms, CHG, E307)	15 (4.6)	HEPA (2)	1.3 E+06 (3.8 E+04)	^{90}Sr ^{137}Cs ^{239,240}Pu	1.3 E–13 ND 3.0 E–16	6.7 E–09 ND 1.6 E–11
296-P-34 (East Tank Farms, CHG, E308)	15(4.6)	HEPA (2)	5.5 E+06 (1.6 E+05)	^{90}Sr ^{137}Cs ^{239,240}Pu ^{241}Am total β	1.9 E–14 ND 2.9 E–16 3.9 E–16 8.7 E–15	3.9 E–09 ND 6.2 E–11 8.3 E–11 1.8 E–09
200 West Area Point Sources						
296-S-22 (West Tank Farms, CHG, W880)	12 (3.7)	HEPA (2)	5.1 E+07 (1.4 E+06)	^{90}Sr ^{134}Cs ^{137}Cs ^{238}Pu ^{239,240}Pu ^{241}Am	1.6 E–16 ND ND ND 6.7 E–18 1.0 E–16	3.1 E–09 ND ND ND 1.4 E–11 2.1 E–10

Table 2-2. Radionuclide Air Emissions from Major Point Sources at Facilities Managed by BHI, CHG, and FH During 1999.
(major point sources have the potential of >0.1 mrem/yr EDE to nearest offsite resident)[a] (4 sheets)

Source[b] (Facility, Contractor, EDP code)	Discharge height, ft (m)	Emission control[c] (stages)	Total flow, ft^3 (m^3)	Radionuclide or type of radioactivity[d]	Average concentration, μCi/ml[e]	Annual emissions, Ci[e]
296-T-18 (West Tank Farms, CHG, W882)	12 (3.7)	HEPA (2)	1.4 E+08 (3.8 E+06)	^{90}Sr ^{134}Cs ^{137}Cs ^{238}Pu ^{239,240}Pu ^{241}Am	2.1 E–15 ND 4.6 E–16 4.7 E–17 1.8 E–15 4.5 E–16	1.1 E–08 ND 2.5 E–09 2.6 E–10 9.7 E–09 2.4 E–09
296-W-4 (WRAP, FH, W123)	47 (14.2)	HEPA (2)	8.6 E+09 (2.4 E+08)	^{90}Sr ^{137}Cs ^{239,240}Pu ^{241}Am	7.9 E–16 ND 5.5 E–17 5.0 E–17	2.6 E–07 ND 1.8 E–08 1.7 E–08
291-Z-1 (PFP, FH, Z810)	200 (61)	HEPA (1-3)	1.5 E+11 (4.3 E+09)	^{238}Pu ^{239,240}Pu ^{241}Pu ^{241}Am	9.6 E–16 3.4 E–14 2.4 E–14 9.0 E–15	4.8 E–06 1.7 E–04 1.2 E–04 4.5 E–05
300 Area Point Sources						
EP-324-01-S (324 Bldg., FH, F025)	157 (48)	HEPA	3.5 E+10 (1.0 E+09)	^{3}H (as HTO)[f] ^{90}Sr ^{125}Sb ^{137}Cs ^{238}Pu ^{239,240}Pu ^{241}Am	1.2 E–10 1.4 E–15 9.8 E–17 ND ND 1.0 E–16 7.7 E–17	1.3 E–01 1.7 E–06 1.1 E–07 ND ND 1.2 E–07 8.9 E–08
EP-327-01-S (327 Bldg., FH, F026)	46 (14)	HEPA	2.5 E+10 (7.2 E+08)	^{90}Sr ^{137}Cs ^{238}Pu ^{239,240}Pu ^{241}Am	8.4 E–16 5.0 E–16 ND 2.9 E–17 5.1 E–17	7.0 E–07 4.2 E–07 ND 2.4 E–08 4.3 E–08

Table 2-2. Radionuclide Air Emissions from Major Point Sources at Facilities Managed by BHI, CHG, and FH During 1999.
(major point sources have the potential of >0.1 mrem/yr EDE to nearest offsite resident)[a] (4 sheets)

Source[b] (Facility, Contractor, EDP code)	Discharge height, ft (m)	Emission control[c] (stages)	Total flow, ft^3 (m^3)	Radionuclide or type of radioactivity[d]	Average concentration, μCi/ml[e]	Annual emissions, Ci[e]
340-NT-EX (340 Waste Handling, FH, F002)	18 (5.5)	HEPA (2)	8.8 E+08 (2.5 E+07)	^{137}Cs ^{238}Pu ***^{239,240}Pu*** ^{241}Am	ND ND 3.9 E–17 3.0 E–17	ND ND 1.2 E–09 8.6 E–10

[a] Nearest offsite receptors who differed from MEI were used to determine state of compliance of each point source with 40 CFR 61, *National Emission Standards for Hazardous Air Pollutants,* Subpart H; EDE = effective dose equivalent.

[b] EDP code = the electronic data processing code, which identifies the sampler; BHI = Bechtel Hanford, Inc., CHG = CH2M HILL Hanford Group, Inc., and FH = Fluor Hanford.

[c] Efficiencies are ≥99.95% for HEPA; ≥95% for charcoal; ≥99.8% for sand filter; 0% for no emission control; HEPA = high-efficiency particulate air filter.

[d] Radionuclides distinguished by both italic and bold typeface are required by 40 CFR 61, Subpart H, to be sampled and analyzed.

[e] Ci = curie; 1 Ci = 3.7+10 becquerels (Bq); μCi/mL = 3.7 E+10 Bq/m^3; ND = not detected (that is, either the radionuclide was not detected in any sample during the year or the average of all the measurements for that given radionuclide or type of radioactivity made during the year was below background levels).

[f] HTO is tritiated water vapor, which is condensable; HT is elemental tritium, an incondensable gas.

Table 2-3. Radionuclide Air Emissions from Minor Point Sources at Facilities Managed by BHI, CHG, and FH During 1999.
(minor point sources have the potential of ≤0.1 mrem/yr EDE to nearest offsite resident)[a] (5 sheets)

Source[b] (Facility, Contractor, EDP code)	Discharge height, ft (m)	Emission control[c]	Total flow, ft^3 (m^3)	Radionuclide of type of radioactivity	Average concentration, μCi/ml[d]	Annual emissions, Ci[d]
100 Areas						
105-KE Basin (100-K Area, FH, Y245-Y248)	42 (12.8)	none	2.5 E+10 (7.0 E+08)	^{90}Sr ^{125}Sb ^{137}Cs ^{154}Eu ^{238}Pu ^{239,240}Pu ^{241}Pu ^{241}Am	2.4 E–14 4.5 E–17 5.5 E–14 6.3 E–17 7.5 E–16 5.3 E–15 6.5 E–14 3.0 E–15	1.9 E–05 3.5 E–08 4.3 E–05 4.8 E–08 5.8 E–07 4.1 E–06 5.0 E–05 2.3 E–06
105-KW Basin (100-K Area, FH, Y234 - Y236)	42 (12.8)	none	1.1 E+10 (3.2 E+08)	^{60}Co ^{90}Sr ^{125}Sb ^{137}Cs ^{238}Pu ^{239,240}Pu ^{241}Pu ^{241}Am	1.1 E–16 1.8 E–15 4.4 E–17 7.2 E–15 ND 1.9 E–16 2.4 E–15 2.3 E–16	3.9 E–08 6.4 E–07 1.5 E–08 2.5 E–06 ND 6.8 E–08 8.4 E–07 8.0 E–08
1706-KE (100-K Area, FH, Y243)	25 (7.6)	HEPA	4.6 E+08 (1.3 E+07)	total α total β	1.6 E–16 2.0 E–15	2.9 E–09 3.5 E–08
116-N (100-N Area, BHI)	closed and deregistered					
107-N (100-N Area, BHI)	closed and deregistered					
RCF–1-EX (100N Area, BHI, Y215)	9.8 (3)	HEPA	3.6 E+07 (1.0 E+06)	total α total β	4.3 E–17 1.1 E–15	6.0 E–11 1.6 E–09
RCF-2-EX (100N Area, BHI, Y216)	9.8 (3)	HEPA	3.1 E+08 (8.8 E+06)	total α total β	ND 4.7 E–16	ND 1.4 E–08
200 East Area						
296-A–13 (East Tank Farms, CHG, E052)	125 (38.1)	HEPA	0	did not operate		
296-A–18 (East Tank Farms, CHG, E060)	15 (4.6)	HEPA	0	did not operate		
296-A–19 (East Tank Farms, CHG, E061)	15 (4.6)	HEPA	5.7 E+08 (1.6 E+07)	total α total β	7.3 E–16 6.1 E–16	1.6 E–08 1.4 E–08
296-A-20 (East Tank Farms, CHG, E197)	24 (7.3)	HEPA	0	did not operate		

Table 2-3. Radionuclide Air Emissions from Minor Point Sources at Facilities Managed by BHI, CHG, and FH During 1999.
(minor point sources have the potential of ≤0.1 mrem/yr EDE to nearest offsite resident)[a] (5 sheets)

Source[b] (Facility, Contractor, EDP code)	Discharge height, ft (m)	Emission control[c]	Total flow, ft^3 (m^3)	Radionuclide of type of radioactivity	Average concentration, μCi/ml[d]	Annual emissions, Ci[d]
296-A-26 (East Tank Farms, CHG, E297)	31 (9.4)	HEPA	8.7 E+08 (2.5 E+07)	total α total β	ND 3.9 E–16	ND 1.3 E–08
296-A-27 (East Tank Farms, CHG, E270)	12 (3.7)	HEPA	5.0 E+08 (1.4 E+07)	total α total β	9.7 E–17 4.1 E–15	2.6 E–09 1.1 E–07
296-A-28 (East Tank Farms, CHG, E272)	12 (3.7)	HEPA	2.0 E+09 (5.6 E+07)	total α total β	8.2 E–16 4.4 E–15	9.7 E–08 5.1 E–07
296-A-29 (East Tank Farms, CHG, E901)	12 (3.7)	HEPA	3.9 E+08 (1.1 E+07)	total α total β	ND 5.8 E–15	ND 1.2 E–07
296-A-30 (East Tank Farms, CHG, E903)	12 (3.7)	HEPA	2.5 E+09 (7.1 E+07)	total α total β	3.3 E–16 2.2 E–15	4.3 E–08 2.8 E–07
296-A-40 (East Tank Farms, CHG, E013)	13.4 (4.1)	HEPA	4.6 E+08 (1.3 E+07)	^{90}Sr ^{137}Cs ^{238}Pu $^{239,240}Pu$ ^{241}Am	4.3 E–16 ND ND 7.2 E–18 2.4 E–17	8.8 E–09 ND ND 1.5 E–10 3.9 E–10
296-A-41 (East Tank Farms, CHG, E015)	29 (8.9)	HEPA	4.4 E+09 (1.2 E+08)	total α total β	ND 4.9 E–16	ND 7.5 E–08
296-A-43 (East Tank Farms, CHG, E148)	55 (16.8)	HEPA	4.6 E+08 (1.3 E+07)	total α total β	ND 3.6 E–16	ND 6.3 E–09
296-P-31 (East Tank Farms, CHG, E209)	33 (10)	HEPA	4.7 E+08 (1.3 E+07)	total α total β	1.5 E–15 3.4 E–15	2.1 E–08 5.0 E–08
296-A-21 (242A Evaporator, FH, E645)	22 (6.7)	HEPA	6.1 E+09 (1.7 E+08)	total α total β	4.1 E–16 7.1 E–16	9.0 E–08 1.6 E–07
296-A-22 (242-A Evaporator, FH, E643)	61 (18.6)	HEPA	2.3 E+08 (6.6 E+06)	total α total β	2.3 E–16 3.0 E–15	1.9 E–09 2.5 E–08
296-E–1 (ETF, FH, E036)	51 (15.5)	HEPA	3.1 E+10 (8.8 E+08)	total α total β	8.9 E–17 2.5 E–16	1.1 E–07 3.0 E–07

Table 2-3. Radionuclide Air Emissions from Minor Point Sources at Facilities Managed by BHI, CHG, and FH During 1999.
(minor point sources have the potential of ≤0.1 mrem/yr EDE to nearest offsite resident)[a] (5 sheets)

Source[b] (Facility, Contractor, EDP code)	Discharge height, ft (m)	Emission control[c]	Total flow, ft^3 (m^3)	Radionuclide of type of radioactivity	Average concentration, μCi/ml[d]	Annual emissions, Ci[d]
200 West Area						
296-P-22 (West Tank Farms, CHG, W191)	15 (4.6)	HEPA	4.6 E+08 (1.3 E+07)	total α total β	2.1 E–16 8.7 E–16	3.4 E–09 1.4 E–08
296-P-23 *backup 296-P-28* (West Tank Farms, CHG, W190, *W195*)	15 (4.6)	HEPA	5.6 E+08 (1.3 E+07)	total α total β	2.5 E–17 4.9 E–14	4.0 E–10 7.8 E–07
296-S–15 (West Tank Farms, CHG, W111)	15 (4.6)	HEPA	1.7 E+09 (4.9 E+07)	total α total β	8.6 E–17 4.9 E–15	5.0 E–09 2.9 E–07
296-S–18 (West Tank Farms, CHG, W096)	22 (6.7)	HEPA	3.4 E+09 (9.6 E+07)	total α total β	9.8 E–16 3.2 E–15	1.4 E–07 4.4 E–07
296-T–17 (West Tank Farms, CHG, W117)	33 (10.1)	HEPA	6.2 E+08 (1.8 E+07)	total α total β	ND 8.6 E–16	ND 1.9 E–08
291-S–1 (S Plant, BHI, S006)	200 (61)	sand filter	1.0 E+10 (2.9 E+08)	total α total β	5.3 E–16 9.8 E–15	2.1 E–07 3.9 E–06
296-S-2 (S Plant, BHI, S032)	68 (20.7)	HEPA	6.0 E+08 (1.7 E+07)	total α total β	6.8 E–15 6.5 E–15	1.6 E–07 1.5 E–07
296-S-7W *backup 296-S-7E* (S Plant, BHI, S016, *S015*)	25 (7.6)	HEPA	5.1 E+09 (1.5 E+08)	total α total β	2.7 E–14 6.8 E–15	4.9 E–06 1.3 E–06
296-S–16 (222-S, FH, S264)	9.8 (3)	HEPA	9.8 E+07 (2.8 E+06)	total α total β	4.6 E–15 1.5 E–14	1.7 E–08 5.8 E–08
296-S-21 (222-S, FH, S289)	38 (11.6)	HEPA	4.0 E+10 (1.1 E+09)	total α total β	ND 2.3 E–16	ND 3.5 E–07
291-T–1 (T Plant, FH, T785)	200 (61)	HEPA	1.7 E+10 (4.8 E+08)	total α total β	4.8 E–14 1.6 E–13	2.9 E–05 9.6 E–05
296-T-7 (T Plant, FH, T154)	28 (8.5)	HEPA	2.5 E+09 (7.1 E+07)	total α total β	ND 6.4 E–16	ND 6.5 E–08
296-T–11 (224-T, FH, T783)	25 (7.6)	HEPA	0	did not operate		
296-T–12 (224-T, FH, T784)	25 (7.6)	HEPA	8.6 E+09 (2.4 E+08)	total α total β	ND 6.5 E–16	ND 2.1 E–07
291-U–1 (U Plant, BHI, U771)	200 (61)	sand filter	1.5 E+10 (4.2 E+08)	total α total β	2.5 E–15 2.8 E–13	1.5 E–06 1.6 E–04

Table 2-3. Radionuclide Air Emissions from Minor Point Sources at Facilities Managed by BHI, CHG, and FH During 1999.
(minor point sources have the potential of ≤0.1 mrem/yr EDE to nearest offsite resident)[a] (5 sheets)

Source[b] (Facility, Contractor, EDP code)	Discharge height, ft (m)	Emission control[c]	Total flow, ft^3 (m^3)	Radionuclide of type of radioactivity	Average concentration, μCi/ml[d]	Annual emissions, Ci[d]
296-W-3 (West Tank Farms, CHG, W003)	25 (7.6)	HEPA	0	did not operate		
296-Z-3 (PFP, FH, Z813)	25 (7.6)	HEPA	4.5 E+08 (1.3 E+07)	^{238}Pu ^{239,240}Pu ^{241}Pu ^{241}Am total β	1.3 E–15 1.3 E–15 1.8 E–15 6.0 E–16 2.6 E–15	3.5 E–08 2.9 E–08 6.5 E–08 1.0 E–08 3.9 E–08
296-Z-5 (PFP, FH, Z913)	8.5	HEPA	5.3 E+09 (1.5 E+08)	total α total β	ND 6.9 E–16	ND 1.4 E–07
296-Z-6 (PFP, FH, Z802)	15 (4.5)	HEPA	3.8 E+09 (1.1 E+08)	total α total β	ND 8.1 E–16	ND 1.2 E–07
296-Z–14 (PFP, FH, Z814)	20 (6.1)	HEPA	6.3 E+08 (1.8 E+07)	total α total β	6.0 E–16 1.8 E–15	1.7 E–08 4.4 E–08
296-Z–15 (PFP, FH, Z915)	42 (12.8)	HEPA	7.9 E+08 (2.2 E+07)	total α total β	ND 1.4 E–16	ND 4.3 E–09
300 Area						
309-PRTR (309 Bldg., FH, F030)	100 (30.5)	none	9.7 E+08 (2.8 E+07)	total α total β	2.9 E–16 7.2 E–16	1.1 E–08 2.7 E–08
EP-327–02-V (327 Bldg., FH, F027)	29.5 (9)	HEPA	3.8 E+08 (1.1 E+07)	total α total β	5.4 E–17 4.1 E–16	6.6 E–10 5.0 E–09
340-B BLDG (340 Bldg., FH, F008)	38 (11.6)	HEPA	did not operate			
340-DECON (340 Bldg., FH, F009)	9.8 (3)	HEPA	3.6 E+09 (1.0 E+08)	total α total β	ND 4.2 E–15	ND 5.9 E–07
400 Area						
FFTF-CB-EX (FFTF, FH, F011, F024)	47 (14.3)	none	1.1 E+10 (3.0 E+08)	^{3}H (as HTO) total α total β	4.8 E–09 3.6 E–17 1.0 E–15	1.4 E+00 1.5 E–08 4.3 E–07
FFTF-HT-TR (FFTF, FH, F013)	29 (8.8)	none	2.9 E+09 (8.1 E+07)	total α total β	ND 9.8 E–16	ND 1.1 E–07
FFTF-RE-SB (FFTF, FH, F012)	20 (6.1)	none	6.7 E+09 (1.9 E+08)	total α total β	1.1 E–15 4.0 E–15	2.9 E–07 1.0 E–06
437-MN&ST (MASF, FH, F014)	30 (9.1)	HEPA	7.5 E+09 (2.1 E+08)	total α total β	ND 7.1 E–16	ND 2.3 E–07
437–1-61 (MASF, FH, F019)	38.4 (11.7)	HEPA	7.1 E+09 (2.0 E+08)	total α total β	ND 4.9 E–16	ND 1.3 E–07

Table 2-3. Radionuclide Air Emissions from Minor Point Sources at Facilities Managed by BHI, CHG, and FH During 1999.
(minor point sources have the potential of ≤0.1 mrem/yr EDE to nearest offsite resident)[a] (5 sheets)

Source[b] (Facility, Contractor, EDP code)	Discharge height, ft (m)	Emission control[c]	Total flow, ft^3 (m^3)	Radionuclide of type of radioactivity	Average concentration, μCi/ml[d]	Annual emissions, Ci[d]
600 Area						
696-W–1 (WSCF, FH, W010)	25 (7.6)	HEPA	2.6 E+10 (7.2 E+08)	total α total β	ND 1.3 E–16	ND 1.3 E–07
696-W-2 (WSCF, FH, W011)	32 (9.8)	HEPA	5.3 E+08 (1.5 E+07)	total α total β	ND 2.0 E–16	ND 4.1 E–09

[a] EDE = effective dose equivalent

[b] EDP code = the electronic data processing code, which identifies the sampler; BHI = Bechtel Hanford Inc., CHG = CH2M HILL Hanford Group, Inc., and FH = Fluor Hanford.

[c] Efficiencies are ≥99.95% for HEPA; ≥95% for charcoal; ≥99.8% for sand filter; 0% for no emission control; HEPA = high-efficiency particulate air filter.

[d] Ci = curie; 1 Ci = 3.7 E+10 becquerels (Bq); 1 μCi/mL = 3.7 E+10 Bq/mL; ND = none detected (that is, either the radionuclide was not detected in any sample during the year or the average of all the measurements for that given radionuclide or type of radioactivity made during the year was below background levels).

Table 2-4. Nonradioactive Air Emissions from Facilities Managed by CHG and FH During 1999.

Source (contractor[a])	Constituent	Annual emissions (kg)[b]
ESPC Distillate-Oil-Fired Boilers[c] (FH)	**Criteria Air Pollutants**	
	particulate matter	8.9 E+02
	nitrogen oxides (NO_x)	8.9 E+03
	sulfur oxides (SO_x)	3.0 E+03
	carbon monoxide (CO)	4.2 E+03
	lead	5.3 E–01
	volatile organic compounds	7.7 E+02
ESPC Natural-Gas-Fired Boilers[c] (FH)	**Criteria Air Pollutants**	
	particulate matter	6.0 E+02
	nitrogen oxides (NO_x)	2.5 E+03
	sulfur oxides (SO_x)	3.0 E+01
	carbon monoxide (CO)	1.1 E+04
	lead	0
	volatile organic compounds	6.5 E+02
East Tank Farms Exhausters (CHG)	nitrogen oxides (NO_x)	6.4 E+03
	sulfur oxides (SOx)	2.4 E+02
	carbon monoxide	9.7 E+03
	volatile organic compounds	4.3 E+03
	ammonia	6.2 E+03
	toxic air pollutants	8.3 E+03
West Tank Farms Exhausters (CHG)	nitrogen oxides (NO_x)	8.7 E+03
	sulfur oxides (SOx)	1.1 E+02
	carbon monoxide	3.7 E+03
	volatile organic compounds	1.6 E+03
	ammonia	3.6 E+03
	toxic air pollutants	4.1 E+03
242-A Evaporator (CHG)	volatile organic compounds	1.8 E+02
	ammonia	0
200 Area ETF (FH)	volatile organic compounds	3.0 E+00
	ammonia	0

[a] CHG = CH2M HILL Hanford Group, Inc., and FH = Fluor Hanford.

[b] Emissions calculated using release factors from EPA 450/4-90–003.

[c] ESPC = Energy Savings Performance Contract.

Table 2-5. Fuel Consumed by Boilers in the 200 and 300 Areas During 1999.

Source	Fuel consumed	
	Distillate oil, gal (L)	Natural gas, ft^3 (m^3)
ESPC oil-fired boilers[a]	9.4 E+05 (3.6 E+06)	
ESCP natural-gas-fired boilers[a]		1.0 E+08 (2.8 E+06)

[a] ESPC = Energy Savings Performance Contract.

3.0 LIQUID EFFLUENTS

Radioactive and nonradioactive liquid effluents were discharged both to ground and to the Columbia River during 1999 from activities and facilities managed by BHI, CHG, and FH, in accordance with state and federal discharge permits. By August 1997, all significant liquid effluent streams in the 200 Area that discharged to individual ground sites were either discontinued or rerouted to the 200 Area TEDF. Rerouted wastewater streams are from the Plutonium Finishing Plant, T Plant, PUREX Plant, B Plant, 242-A-81 Building, and 283-E and 283-W Water Treatment Plants. Other rerouted streams consist of steam condensate and cooling water from the 242-A Evaporator, 241-A Tank Farm, 244-AR Vault, and B Plant. Individual reporting on contributory streams is no longer required; however, data are reported on the collective effluent discharged from the 200 Area TEDF to its two disposal basins.

Beginning in November 1995, the ETF began treating 242-A Evaporator process condensate, which previously had been discharged directly to ground. The ETF also treats other radioactive liquids generated at the Hanford Site, such as groundwater from the UP-1 Operable Unit and wastewater from the 222-S Laboratory. The ETF treats liquid waste by filtration, ultraviolet oxidation, pH adjustment, and reverse osmosis before they are sampled, analyzed, and approved for discharge to the State Approved Land Disposal Site (SALDS). Individual reporting on contributory streams is no longer required; however, data on the collective effluent discharged from the ETF is reported.

3.1 NPDES PERMITTED DISCHARGES TO COLUMBIA RIVER

Liquid effluents discharged to the Columbia River in 1999 from the 100–K, 100–N, and 300 Areas were regulated in accordance with NPDES permits WA–000374-3 and WA–002591–7 for the Hanford Site. Table 3–1 lists those discharge points. As of May 5, 1999, a newly revised version of NPDES Permit WA–002591–7 for the Hanford Site was issued and NPDES Permit WA–00374–3 was eliminated. The revised permit regulates only two discharge points, the 300 Area Treated Effluent Disposal Facility (TEDF) and the 1908–K Outfall. Six discharge points listed in the now-canceled permit WA–000374–3 were omitted in the revised permit (refer to Table 3-1 for a listing of these omitted discharge points). Five of those six omitted discharge points ceased being active prior to 1999, whereas the 1301-N Springs remained active throughout all of 1999.

Summaries of NPDES-regulated discharge parameters are in Table 3-2. Combined totals of radionuclides discharged to the Columbia River are in Table ES-2 of the Executive Summary. Table 3-3 presents radionuclide release data by individual liquid effluent stream. The next three sections discuss the NPDES discharge streams that were active during 1999.

3.1.1 300 Area Treated Effluent Disposal Facility

The 300 Area TEDF (NPDES discharge number: 001) treats wastewater before discharging it to the Columbia River. In 1999, all 300 Area nonradioactive liquid effluents were routed to this TEDF for treatment prior to discharge. Table 3-2 has monitoring and analytical data on parameters specified in the previous and newly revised NPDES Permit WA–002591–7.

3.1.2 1908-K Outfall

The 1908-K Outfall (NPDES discharge number: 004) discharges potentially hazardous chemical and radioactive substances to the Columbia River. Monitoring and analytical data on parameters specified in the now-obsolete NPDES Permit WA–000374-3 and in the newly revised NPDES Permit WA–002591–7 are in Table 3-2.

3.1.3 100-N Riverbank Springs

The 100-N Riverbank Springs, also referred to as the N Springs (NPDES discharge identifier: 1301-N Springs), discharges radionuclides and potentially hazardous chemical substances to the Columbia River. Monitoring and analytical data on parameters specified in the now-obsolete NPDES Permit WA–000374-3 are in Table 3-2. This active discharge point is no longer regulated under NPDES, as of May 5, 1999.

3.2 STATE PERMITTED DISCHARGES TO GROUND

All liquid effluent streams discharged to ground on the Hanford Site are governed by State Waste Discharge Permits. The streams for which the state has issued waste discharge permits are listed in Table 3–1 and described in succeeding sections.

3.2.1 200 Area Treated Effluent Disposal Facility

The 200 Area TEDF discharges treated wastewater to ground. The facility consists of a piping network that conveys wastewater from numerous other facilities on the Hanford Site to two 5-acre disposal basins, located near the facility. Discharges from the 200 Area TEDF are regulated in accordance with State Waste Discharge Permit ST 4502. Monitoring and analytical data on parameters specified in the permit are in Table 3-4. The discharges routinely meet state drinking water standards.

3.2.2 200 Area Effluent Treatment Facility

The 200 Area Effluent Treatment Facility (ETF) discharges treated wastewater. The discharges are regulated in accordance with State Waste Discharge Permit ST 4500. Monitoring and analytical data on parameters specified in the permit are in Tables 3-3 and 3-4.

3.2.3 400 Area Secondary Cooling Water

The 400 Area Secondary Cooling Water Stream discharges cooling water from the secondary cooling loop of the FFTF reactor. This stream is regulated in accordance with State Waste Discharge Permit ST 4501. Monitoring and analytical data on parameters specified in the permit are in Table 3-4.

3.2.4 183-N Backwash Discharge Pond

The 183-N Backwash Discharge Pond receives three untreated wastewater streams from the 183-N Water Treatment Facility, which converts raw water from the Columbia River into potable water for use at 100–N Area. The discharges, regulated in accordance with State Waste Discharge Permit ST 4503, originate from these activities or sources: annual draining and washing of the coagulator basins; a potable-water sample tap having a continuous flow; a drain in an area used to dry potable-water containers; and backwashing of the multimedia gravity filters. Monitoring and analytical data on parameters specified in the permit are in Table 3-4.

3.2.5 100-N Sewage Treatment Lagoon

The 100-N Sewage Treatment Lagoon treats sewage from the 100-N, 100-K, and 200 Areas. Domestic wastewater from the 100-N Sewage Treatment Lagoon is discharged to ground in accordance with State Waste Discharge Permit ST 4507. Leachate from residual solids and from radioactive waste is not sanctioned by the permit. Monitoring and analytical data on parameters specified in the permit are in Table 3-4.

3.2.6 Hydrotest, Maintenance, and Construction Discharges

Wastewater discharges to soil as a result of hydrotests, maintenance, and construction activities, regulated in accordance with State Waste Discharge Permit ST 4508, occur at numerous locations throughout the Hanford Site. Sampling the discharges is not required as long as compliance is maintained with an Ecology-approved Pollution Prevention and Best Management Practices Plan (DOE/RL-97-67, Rev. 3). Forty-one significant discharges, by permit definitions, were reported for 1999. The definitions for a significant discharge are that (1) wastewater discharges to ground exceed 14,500 gallons in a 24-hour period and (2) any single discharge exceeds 50,000 gallons in a calendar year. The majority of the reported significant discharges were potable water used to test fire hydrants.

3.2.7 Cooling Water and Steam Condensate Discharges

Cooling water and steam condensate discharges, regulated in accordance with State Waste Discharge Permit ST 4509, occur at numerous locations throughout the Hanford Site. Sampling the discharges is not required as long as compliance is maintained with an Ecology-approved Pollution Prevention and Best Management Practices Plan (DOE/RL-97-67, Rev. 3).

3.2.8 Stormwater Discharges

Industrial stormwater discharges collected in engineered structures and then discharged to engineered structures occur at numerous locations throughout the Hanford Site. Stormwater discharges are regulated in accordance with State Waste Discharge Permit ST 4510, issued on April 1, 1999. Sampling the discharges is not required as long as compliance is maintained with an Ecology-approved Pollution Prevention and Best Management Practices Plan (DOE/RL-97-67, Rev. 3).

3.3 SANITARY SEWAGE DISCHARGES TO GROUND

Various facilities discharged sanitary sewage during 1999. In the 100-N Area, sanitary wastewater was discharged to the 100-N Sewage Treatment Lagoon and to five septic tanks. In the 100-DR and 100-K Areas, sanitary sewage was discharged to septic tanks and drain fields, with a portion of the sewage in the 100-K Areas collected in and delivered by tanker truck to the 100-N Sewage Treatment Lagoon. In the 200 Areas, sanitary wastewater was discharged to a system of septic tanks and drain fields. Sludge was pumped from septic tanks in the 200 Areas and taken to the 100-N Sewage Treatment Lagoon for disposal. In the 300 Area, sanitary sewage was discharged to the city of Richland's POTW. In the 400 Area, sanitary sewage was discharged to the WPPSS sewage treatment plant.

The estimated volume of sewage discharged in each operating area during 1999 is shown in Table 3-5. All sanitary sewer discharges are estimated by multiplying the total number of personnel stationed in each area by 15/gal/day-person (57 L/day-person) and by 250 business days in 1999.

Table 3–1. National Pollutant Discharge Elimination System and State Permitted Discharge Points Active in 1999.

Designation	Description
NPDES Discharge Points[a]	
001	300 Area Treated Effluent Disposal Facility (TEDF)
004	1908-K Outfall
1301-N Springs	100-N Riverbank Springs
State Permitted Discharge Points	
ST 4500	200 Area Effluent Treatment Facility (ETF)
ST 4501	400 Area Secondary Cooling Water
ST 4502	200 Area Treated Effluent Disposal Facility (TEDF)
ST 4503	183-N Backwash Discharge Pond
ST 4507	100-N Sewage Treatment Lagoon
ST 4508	Hydrotest, Maintenance, and Construction Discharges
ST 4509	Cooling Water and Steam Condensate Discharges
ST 4510	Industrial Stormwater Discharges

[a] As of May 5, 1999, five NPDES discharge points, which did not operate in 1999, were not included in the newly revised permit for the Hanford Site (WA–002591–7), which now regulates only two discharge points, 001 and 004 (1301-N Springs also was snot included in the revised permit). The discharge points not included are: 181-KE Inlet Screen Backwash (designation 003), 182-N Tank Farm Overflow (designation 005), 182-N Drain System (designation 006), 181-N Inlet Screen Backwash (designation 007), and 102-Inch Raw Water Return Line (designation 009).

Table 3-2. Summary of National Pollutant Discharge System Effluents Released to the Columbia River in 1999. (2 sheets)

Sample parameter	1908-K Outfall (004)		N-Springs (1301-N Springs)		300 Area TEDF (001A)	
	Avg.	Max.	Avg.	Max.	Avg.	Max.
Flow rate (MGD)	0.45	5.28	*	*	0.162	0.243
Temperature (°F)	*	70.0	*	56.7	74	92
pH (minimum and maximum)	7.0	8.3	7.7	7.7	6.5	8.8
Total suspended solids (μg/L)	0.2	1.4	*	*	1,000	9,000
Oil and grease (mg/L)	*	*	1.1	1.1	*	*
Aluminum (μg/L)	*	*	*	*	27.9	43.2
Arsenic (μg/L)	*	*	*	*	<0.4	2.85
Beryllium (μg/L)	*	*	*	*	<0.2	<0.2
Cadmium (μg/L)	*	*	*	*	<0.2	0.75
Chromium (mg/L)	*	*	0.0018	0.0018	*	*
Chlorine (mg/L)	0.04	0.5	*	*	*	*
Copper (μg/L)	*	*	*	*	3.11	8.62
Iron (μg/L)	*	*	0.022	0.022	6.2	26.1
Lead (μg/L)	*	*	*	*	<0.2	5.6
Manganese (μg/L)	*	*	*	*	<0.2	0.55
Mercury (μg/L)	*	*	*	*	<0.2	<0.2
Nickel (μg/L)	*	*	*	*	0.98	7.05
Radium (pCi/L)	*	*	*	*	<0.2	<0.2
Selenium (μg/L)	*	*	*	*	<3	3.32
Silver (μg/L)	*	*	*	*	<0.3	0.37
Zinc (μg/L)	*	*	*	*	2.44	9.57
Nitrogen (as ammonia) (μg/L)	*	*	<0.1	<0.1	<50	64.6
Bis(2-ethylhexyl)phthalate (μg/L)	*	*	*	*	<3	16
Chlorodiflouromethane (μg/L)	*	*	*	*	<5	<5
Chloroform (μg/L)	*	*	*	*	<5	7
Coliform (growth/100mL)	*	*	*	*	<3.7	<3.7
Cyanide (μg/L)	*	*	*	*	<5	<5
Dichlorobromomethane (μg/L)	*	*	*	*	<2.2	<2.2
1,1-Dichloroethane (μg/L)	*	*	*	*	<4.7	<4.7
Methylenechloride (μg/L)	*	*	*	*	<3	<3

Table 3-2. Summary of National Pollutant Discharge System Effluents Released to the Columbia River in 1999. (2 sheets)

Sample parameter	1908-K Outfall (004)		N-Springs (1301-N Springs)		300 Area TEDF (001A)	
	Avg.	Max.	Avg.	Max.	Avg.	Max.
Nitrite (NO_2) (μg/L)	*	*	*	*	<50	104.5
Tetrachloroethylene (μg/L)	*	*	*	*	<5	<5
1,1,1-Trichloroethane (μg/L)	*	*	*	*	<5	<5
Trichloroethylene (μg/L)	*	*	*	*	<1.9	<1.9
Toluene (μg/L)	*	*	*	*	<6	<6

MGD = million gallons per day;* = analysis not required; °F = degrees Fahrenheit; μg/L = micrograms per liter; mg/L = milligram per liter.

Table 3-3. Radionuclides in Liquid Effluent Streams Discharged to the Environment from Facilities Managed by BHI and FH During 1999.

Liquid effluent stream (contractor; EDP code)[a]	Discharge location	Total flow, gal (L)	Radionuclide or type of radioactivity	Average concentration, μCi/mL[b]	Annual release, Ci[b]
100 Area Discharges to the Columbia River					
N-Springs (BHI; Y101)	Columbia River	6.0 E+06 (2.3 E+07)	^{3}H	ND	ND
			^{90}Sr	3.2 E–06	7.2 E–02
NPDES Outfall 004, 100-K 1908-K Outfall (FH; Y130)	Columbia River	5.3 E+07 (2.0 E+08)	^{3}H	ND	ND
			^{60}Co	ND	ND
			^{90}Sr	2.5 E–09	5.0 E–04
			^{106}Ru	ND	ND
			^{125}Sb	ND	ND
			^{134}Cs	ND	ND
			^{137}Cs	ND	ND
			^{154}Eu	ND	ND
			^{155}Eu	ND	ND
			^{238}Pu	ND	ND
			$^{239,240}Pu$	7.5 E–11	1.5 E–05
			^{241}Am	8.1 E–11	1.6 E–05
			total α	7.5 E–11	1.5 E–05
			total β	6.4 E–10	1.3 E–04
Discharges to Ground in the 200 Area					
200 Area Effluent Treatment Facility (FH; H129)	616-A Crib (SALDS)	2.3 E+07 (8.8 E+07)	^{3}H	1.0 E–04	9.0 E+00
			^{90}Sr	1.6 E–09	1.7 E–04
			^{226}Ra	5.6 E–11	5.2 E–06
			^{237}Np	7.9 E–11	7.0 E–06
			^{238}Pu	1.9 E–11	1.7 E–06
			$^{239,240}Pu$	1.0 E–10	9.2 E–06
			^{241}Am	6.6 E–11	5.8 E–06

[a] EDP code = electronic data processing code, which identifies the sampler; BHI =Bechtel Hanford, Inc., and FH = Fluor Hanford.

[b] Ci = curie; 1 Ci = 3.7 E+10 becquerels (BQ); 1 μCi/mL = 3.7 E+10 Bq/m^3; ND = none detected.

Table 3-4. Summary of Discharge Monitoring Reports for State Permitted Discharge Points in 1999. (3 sheets)

Sample parameter	200 Area Effluent Treatment Facility (ST 4500)		400 Area Secondary Cooling Water (ST 4501)		200 Area TEDF (ST 4502)		183-N Backwash Discharge Pond (ST 4503)		100-N Sewage Treatment Lagoon (ST 4507)	
	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.
Effluent flow rate (gal/month)	*	3.94 E+06	*	*	*	*	*	*	*	*
Effluent flow rate (gal/day)	*	*	*	*	*	*	10,700	66,000	3,218	7,270
Effluent flow rate (gal/min)	*	*	22.7	143	267	1,202	*	*	*	*
Influent flow rate (gal/day)	*	*	*	*	*	*	*	*	6,245	11,327
pH (minimum and maximum)	*	*	8.57	8.76	7.6	9.5	7.26	7.47	7.96	8.7
Conductivity (μmhos/cm)	NQ	NQ	*	*	195	287	*	*	*	*
Total suspended solids (μg/L)	NQ	NQ	*	*	*	97,000	*	*	24,000	73,000
Total dissolved solids (μg/L)	NQ	3,670	446,000	494,000	86,100	*	*	*	330,000	401,000
Biochemical oxygen demand (mg/L)	*	*	*	*	*	*	*	*	14	33
Total organic carbon (μg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Total organic halides (μg/L)	*	*	32.3	55	*	*	*	*	*	*
Total trihalomethanes (μCi/L)	*	*	*	*	NQ	NQ	14.6	22.0	*	*
Oil and grease (mg/L)	*	*	*	*	NQ	NQ	*	*	*	*
Arsenic (μg/L)	NQ	NQ	NQ	NQ	NQ	NQ	*	*	*	*
Beryllium (μg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Cadmium (μg/L)	NQ	NQ	NQ	NQ	NQ	NQ	*	*	*	*
Chlorine (mg/L)	*	*	*	*	*	*	0.173	0.38	*	*
Chromium (mg/L)	NQ	NQ	*	*	NQ	NQ	*	*	*	*
Cobalt (μg/L)	*	*	*	*	*	*	*	*	*	*
Copper (μg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Iron (μg/L)	*	*	*	*	367	2,811	*	*	*	*
Lead (μg/L)	NQ	NQ	NQ	NQ	NQ	NQ	*	*	*	*
Manganese (μg/L)	*	*	NQ	NQ	24	161	*	*	*	*

Table 3-4. Summary of Discharge Monitoring Reports for State Permitted Discharge Points in 1999. (3 sheets)

Sample parameter	200 Area Effluent Treatment Facility (ST 4500)		400 Area Secondary Cooling Water (ST 4501)		200 Area TEDF (ST 4502)		183-N Backwash Discharge Pond (ST 4503)		100-N Sewage Treatment Lagoon (ST 4507)	
	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.
Mercury (µg/L)	NQ	NQ	*	*	NQ	NQ	*	*	*	*
Nitrogen (total Kjeldahl nitrogen) (µg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Acetophenone (µg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Ammonia (reported as N) (µg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Benzene (µg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Bis(2-ethylhexyl)phthalate (µg/L)	*	*	*	*	NQ	2.6	*	*	*	*
Carbon tetrachloride (µg/L)	NQ	NQ	*	*	NQ	NQ	*	*	*	*
Chloride (µg/L)	NQ	NQ	19,110	21,300	5,395	18,270	*	*	*	*
Chloroform (µg/L)	NQ	NQ	*	*	2.3	7.3	*	*	*	*
Cyanide (µg/L)	*	*	NQ	NQ	NQ	NQ	*	*	*	*
Methylene chloride (µg/L)	NQ	3.8	*	*	0.4	4.5	*	*	*	*
Nitrate (reported as N) (µg/L)	NQ	NQ	170	250	104	260	*	*	*	*
Nitrite (reported as N) (µg/L)	NQ	NQ	NQ	NQ	*	*	*	*	*	*
N-Nitrosodiumethylamine (µg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Phenol (µg/L)	*	*	*	*	NQ	NQ	*	*	*	*
Phosphorus (µg/L)	*	*	1,528	1,800	*	*	*	*	*	*
Sulfate (µg/L)	NQ	NQ	*	*	19,920	24,900	43,700	48,400	*	*
Tetrachloroethylene (µg/L)	NQ	NQ	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane (µg/L)	*	*	*	*	NQ	NQ	*	*	*	*

Table 3-4. Summary of Discharge Monitoring Reports for State Permitted Discharge Points in 1999. (3 sheets)

Sample parameter	200 Area Effluent Treatment Facility (ST 4500)		400 Area Secondary Cooling Water (ST 4501)		200 Area TEDF (ST 4502)		183-N Backwash Discharge Pond (ST 4503)		100-N Sewage Treatment Lagoon (ST 4507)	
	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.
1,1,2-Trichloroethane (μg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Tetrahydrofuran (μg/L)	NQ	NQ	*	*	*	*	*	*	*	*
WTPH-G (μg/L)	*	*	*	*	NQ	NQ	*	*	*	*
Total alpha (pCi/L)	NQ	3.6	*	*	3.7	23.5	*	*	*	*
Total beta (pCi/L)	NQ	2.1	13.4	15.3	1.5	13.5	*	*	*	*
^{226}Ra (pCi/L)	*	*	*	*	NQ	NQ	*	*	*	*
^{226}Ra and ^{228}Ra (pCi/L)	*	*	*	*	NQ	NQ	*	*	*	*
^{90}Sr (pCi/L)	NQ	3.5	*	*	*	*	*	*	*	*
^{99}Tc (pCi/L)	NQ	NQ	*	*	*	*	*	*	*	*
Tritium (^{3}H) (pCi/L)	*	*	3,774	4,240	*	*	*	*	*	*
Tritium (^{3}H) (Ci/month)	0.74	8.7	*	*	*	*	*	*	*	*
Total uranium	NQ	NQ	*	*	*	*	*	*	*	*

[a] * = analysis not required; NQ = nonquantifiable (that is, below practical quantification limits [PQL]).

Table 3-5. Sanitary Sewage Discharged to the Soil During 1999.

Area	Population	Discharge,[a] gal/yr (L/yr)
100-DR	30	1.1 E+05 (4.3 E+05)
100-K	320	1.2 E+06 (4.5 E+06)[b]
100-N	168	6.3 E+05 (2.4 E+06)[b]
200 East	2,150	8.1 E+06 (3.1 E+07)[b]
200 West	1,600	6.0 E+06 (2.3 E+07)[b]
300	1,900	0[c]
400	350	1.3 E+06 (5.0 E+06)[d]
600	342	1.3 E+06 (4.9 E+06)

[a] Discharges were calculated by multiplying an estimated average number of people assigned to each area (worker populations fluctuate throughout the year) on the basis of a person generating 15 gal/day (57 L/day) of sanitary sewage while working 250 days/yr.

[b] A portion of this discharge was transported via pipe or tanker truck to the 100-N Sewage Treatment Lagoon, where it was treated and released to the soil; data on 100-N Sewage Treatment Lagoon effluents are in Table 3-4. The remaining sanitary sewage is assumed to have been discharged to treatment systems, such as septic tanks and drain fields in each respective area.

[c] Discharges from the 300 Area were routed the city of Richland POTW; hence, that discharge volume on the Hanford Site is considered zero.

[d] Discharges from the 400 Area were routed to the WPPSS sanitary sewer system; hence, that discharge volume on the Hanford Site is considered zero.

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4.0 HAZARDOUS SUBSTANCE RELEASES

Hazardous substances, whether radioactive or nonradioactive, released to the environment must be evaluated to determine if they are reportable to federal, state, or local regulatory agencies. Agency notification is required when a released amount exceeds reporting thresholds. Reportable releases of hazardous substances are classified as one of the following two types:

- Nonroutine releases
- Continuous, routine releases.

Each type of release is discussed in the following sections.

4.1 NONROUTINE RELEASES

During 1999, eight nonroutine releases reported to regulatory agencies were identified as having entered the environment. Those releases are summarized in Table 4–1. None of them caused a measurable offsite impact.

CH2M HILL Hanford Group, Inc.

Five nonroutine releases, reported in accordance with regulatory agency notification requirements for CHG and its subcontractors, were identified as having entered the environment

Fluor Hanford

Three nonroutine releases, reported in accordance with the regulatory agency notification requirements of FH and its subcontractors, were identified as having entered the environment.

4.2 ROUTINE CONTINUOUS RELEASES

Releases of hazardous substances that exceed CERCLA reportable quantities (RQ) need not be reported immediately to the National Response Center when both of the following conditions are met:

- An initial notification has been completed
- The routine releases are continuous and stable in quantity and rate.

Historically at the Hanford Site, only the continuous, routine releases of ammonia, ammonium hydroxide, and carbon tetrachloride have posed operational difficulties in staying beneath RQs. During 1999, releases of ammonia, ammonium hydroxide, and carbon tetrachloride were below reportable quantities and continuous and stable in quantity and rate.

Table 4–1. CHG and FH Reportable Releases to the Environment During 1999.

Contractor	Agency notified	Material released	Quantity	Description of release event
FH	WDOH	radioactive air	4.5 E–05 Ci of, conservatively, $^{239,240}Pu$	On 3/3/99, fixed contamination was loosened from the inner surface of the 291-Z–1 exhaust system and emitted; the event was believed to have been caused by high winds vibrating exposed ductwork, but exact cause was undetermined.
FH	Ecology	chlorine gas	detectable amount	On 3/25/99, at the 283 Water Filter Plant, 200 East Area, a "high-high" alarm sounded during changeout of 1-ton cylinders containing chlorine gas, a small amount of which was vented to atmosphere.
CHG	Ecology	radioactive water	≅ 7.7 to 11.5 kg	On 7/27/99, radioactive water was released to the ground from a drillstring that was wrapped in a plastic bag. The released water had been the cooling water used while the drillstring was being cut.
CHG	WDOH	radioactive air	undetermined amount of Sr-90	On 8/4/99 during work in the 241-U B-valve pit, in the 241-U Tank Farm Complex, the filter from a job-specific air sampler showed indications of a Sr-90 release.
CHG	WDOH	radioactive air	undetermined amount of Sr-90	On 8/5/99 during work near the 241-AZ–102 tank, in the AY-AZ Tank Farm Complex, the filter from a job-specific air sampler showed indications of a Sr-90 release.
CHG	WDOH	radioactive air	air sample readings were 1.8 E–12 μCi/ml total alpha, 4.58 E–10 μCi/ml total beta	On 8/9/99 during a push-mode sampling activity in the 241-AZ Tank Farm Complex, removable contamination was discovered around riser 24A.
CHG	WDOH	radioactive air	undetermined	On 8/31/99, radioactive air leaked from around a seal of a plastic bag that was placed over the end of a pipe of a transfer line in a valve pit in the 241-U Tank Farm Complex. indicated release of Sr-90
FH	WDOH	radioactive air	undetermined	On 9/15/99, unfiltered radioactive air was released inside an open-top greenhouse during changeout of 296-B-1 ventilation system filter.

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