

# Summary

*L. F. Morasch*

Each year, the U.S. Department of Energy (DOE) publishes this integrated environmental report on the Hanford Site to summarize environmental data and information, describe environmental management performance, demonstrate the status of compliance with environmental regulations, and highlight major environmental programs and efforts. Individual sections of the report are designed to

- describe the Hanford Site and its mission
- summarize the status of compliance with environmental regulations
- describe the environmental programs at the Hanford Site

- discuss the estimated radiation exposure to the public from 2000 Hanford Site activities
- present effluent monitoring, environmental surveillance, and groundwater protection and monitoring information
- discuss activities to ensure quality.

DOE's current mission at the Hanford Site is twofold: environmental management and science and technology. It is the policy of DOE that all activities be carried out to comply with applicable federal, state, and local laws and regulations, DOE Orders, Secretary of Energy Notices, and directives, policies, and guidelines from DOE Headquarters and site operations.

---

## Compliance with Environmental Regulations in 2000

Activities at the Hanford Site in 2000 were conducted in compliance with DOE directives, federal environmental protection statutes, and related state and local environmental protection regulations. A key element in Hanford's compliance program is the Tri-Party Agreement. The Tri-Party Agreement is an agreement among the Washington State Department of Ecology, EPA, and DOE to achieve compliance with the remedial action provisions of the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) and with treatment, storage, and disposal unit regulation and corrective action provisions of the *Resource Conservation and Recovery Act* (RCRA). In 2000, 45 of 48 specific Tri-Party Agreement cleanup milestones were completed on or before their required due dates. Two milestones were delayed because of programmatic issues, and one remained at issue at the time of this report.

Cleanup activities on the Hanford Site generate radioactive, hazardous, and mixed waste. This waste is handled and prepared for safe storage on the site or shipped to offsite facilities for treatment and disposal. In 2000, cleanup activities generated 441,000 kilograms (973,000 pounds) of solid mixed waste and 700,000 kilograms (1.5 million pounds) of radioactive waste on the Hanford Site. There were also 1,381 kilograms (3,045 pounds) of mixed waste and 6.9 million kilograms (15.3 million pounds) of radioactive waste received at Hanford from offsite.

In addition to newly generated waste, significant quantities of legacy waste remain from years of nuclear material production and waste management activities. Most legacy waste from past operations at the Hanford Site resides in RCRA-compliant waste sites or is stored in several places



awaiting cleanup and ultimate safe storage or disposal. Examples include high-level radioactive waste stored in single- and double-shell tanks and transuranic waste stored in vaults and on storage pads (see Section 2.5 for details).

The site's compliance with federal acts in 2000 is summarized in Table S.1. For a detailed discussion of the site's compliance with environmental regulations during 2000, refer to Chapter 2 of this report.

**Table S.1. Compliance with Federal Acts at the Hanford Site in 2000**

<b>Regulation</b>	<b>What it Covers</b>	<b>2000 Status</b>
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	Sites already contaminated by hazardous materials	Work on these sites was in compliance with CERCLA requirements and met the schedules established by the Tri-Party Agreement.
Emergency Planning and Community Right-to-Know Act	The public's right to information about hazardous chemicals in the community and establishes emergency planning procedures	The Hanford Site was in compliance with the reporting and notification requirements contained in this act.
Resource Conservation and Recovery Act (RCRA)	Hazardous waste being generated, transported, stored, treated, or disposed. The act primarily covers ongoing waste management at active facilities.	The Washington State Department of Ecology identified several violations during 2000. The violations identified RCRA-regulated waste that was shipped offsite and violations of the management agreement. Another violation identified 26 drums of dangerous and/or mixed waste collected more than 20 years ago that were improperly labeled, and a drum of flocculent that was not properly designated as required by WAC 173-303. Other violations included an inspection matter and the application of regulations to determine the integrity of the double-shell tank system. All problems identified have been, or are being, corrected.
Clean Air Act	Air quality, including emissions from facilities and diffuse and unmonitored sources	According to the Washington State Department of Health, air emissions from Hanford Site facilities were well below state and federal standards. However, the calibration of some air monitoring equipment needed to be corrected, and in one instance, proper permits were not obtained.
Clean Water Act	Discharges to U.S. waters	Copper, manganese, and zinc were detected at levels higher than permits allow at one discharge line near the 300 Area shoreline. Also, some 300 Area procedures had to be corrected and equipment at the 100-N Sewage Lagoon had to be repaired. In addition, the permit limits for pH and total suspended solids were exceeded at the 100-N Sewage Lagoon, though the cause was believed to be an algae bloom caused by warm weather.

<b>Regulation</b>	<b>What it Covers</b>	<b>2000 Status</b>
Safe Drinking Water Act	Drinking water supplies operated by DOE	All Hanford drinking water systems were in compliance with guidelines according to the Washington State Department of Health. There was one exception on February 3, 2000, when sampling results showed the maximum contaminant level of coliform bacteria was exceeded at the 200-East Area, but no <i>E.coli</i> were found.
Toxic Substances Control Act	Primarily chemicals called polychlorinated biphenyls	Hanford was in compliance with the requirements of this act.
Federal Insecticide, Fungicide, and Rodenticide Act	Storage and use of pesticides	Hanford was in compliance with the requirements of this act.
Endangered Species Act	Rare species of plants and animals	Hanford activities complied with the requirements of this act. The Hanford Site has eight plant species, two fish species, and five bird species on the federal or state list of threatened or endangered species.
American Indian Religious Freedom Act, Antiquities Act, Archaeological and Historic Preservation Act, Archaeological Resources Protection Act, Historic Sites Buildings and Antiquities Act, National Historic Preservation Act, and Native American Graves Protection and Repatriation Act	Cultural resources	Hanford was in compliance with the requirements of these acts.
National Environmental Policy Act	Environmental impact statements for federal projects	Hanford was in compliance with the requirements of this act.
Migratory Bird Treaty Act	Migratory birds or their feathers, eggs, or nests	Hanford was in compliance with the requirements of this act. There are over 100 species of birds that occur on the Hanford Site that are protected by this act.

## Environmental Monitoring

Environmental monitoring at the Hanford Site includes effluent monitoring, near-facility environmental monitoring, surface environmental surveillance, groundwater monitoring, and vadose zone monitoring. Facility operators perform effluent monitoring by analyzing samples collected near points of release to the environment. Near-facility monitoring includes the analysis of environmental samples collected near major nuclear-related

installations, waste storage and disposal units, and remediation sites. Surface environmental surveillance consists of sampling and analyzing various media on and around the site (including the Columbia River) to detect potential contaminants and to assess their significance to environmental and human health. Groundwater sampling is conducted on the site to determine the distribution of





radiological and chemical constituents in groundwater. The strategy for managing and protecting groundwater resources at the Hanford Site focuses on protection of the Columbia River, human health, the environment, treatment of groundwater contamination, and limitation of groundwater migration. Vadose monitoring activities were conducted to better understand and alleviate the spread of subsurface contamination.

The overall objectives of these monitoring and surveillance programs are to demonstrate

compliance with applicable federal, state, and local regulations; confirm adherence to DOE environmental protection policies; and support environmental management decisions.

Environmental monitoring and surveillance results for 2000 are summarized in Table S.2. For detailed discussions of results, refer to the appropriate sections of this report.

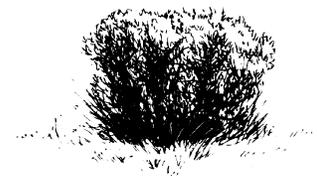
**Table S.2. Hanford Site Monitoring Results for 2000**

	<b>What was Monitored?</b>	<b>The Bottom Line</b>
Air	Air sampling equipment collected particles and gases, which were analyzed for radioactive and non-radioactive materials. Air was sampled at 110 locations on Hanford, 11 perimeter locations, 8 nearby communities, and 2 distant communities.	All measurements of radioactive and non-radioactive materials in air were below recommended guidelines.
Columbia River Water	Columbia River water was collected from 15 locations throughout the year. Water samples were analyzed for radioactive and chemical materials. Water in the Columbia River continues to be designated Class A (Excellent) by the state of Washington. This designation means that the water is usable for substantially all needs.	As in past years, small amounts of radioactive materials were detected downriver from Hanford. However, the amounts were all far below federal and state limits. During 2000, there was no indication of any deterioration of Columbia River water quality resulting from site operations along the Hanford Reach.
Columbia River Shoreline Springs	Groundwater discharges to the Columbia River via surface and subsurface locations. Discharges above the water level of the river are identified as riverbank springs. Samples of spring water were collected at seven locations along the Columbia River shoreline.	Samples collected at the springs contained contaminants at levels above drinking water standards. However, concentrations in river water downstream of the shoreline springs remained far below federal and state limits.
Groundwater	Groundwater samples were collected from 694 wells to analyze water quality. Water levels were measured in several hundred wells on the site to map groundwater movement.	Groundwater monitoring is focused on preventing the spread of contamination. Samples show that groundwater contaminant plumes are moving slowly from beneath former waste sites toward the Columbia River. Contaminant concentrations are declining in the largest plumes because of spreading and radioactive decay.

### **What was Monitored?**

### **The Bottom Line**

Vadose Zone	The vadose zone is the region between the ground surface and the top of the water table. Vadose zone characterization and monitoring are conducted to better understand and alleviate the spread of subsurface contamination.	Vadose zone characterization was conducted at four sites in the 200 Areas and at one site in the 100-DR Area. Vadose zone monitoring occurred at four sites in 2000. Technical demonstrations are designed to result in new, innovative methods for environmental monitoring and cleanup on the Hanford Site. A small-diameter, passive neutron tool and a small diameter spectral gamma logging tool were demonstrated in 2000. Both tools could result in substantial cost savings over conventional methods of characterization and monitoring. In addition, the first of four field tests to evaluate how contaminant plumes move in the vadose zone were completed.
Drinking Water	The quality of the drinking water supplied by 11 DOE-owned systems on the Hanford Site was analyzed.	All DOE-owned drinking water systems on the Hanford Site were in compliance with Washington State and EPA regulations. The concentrations of radiological contaminants in all samples were below state and federal standards.
Food and Farm Products	Samples of milk, leafy vegetables, vegetables, fruit, and wine were collected from 15 locations around the Hanford Site.	Radionuclide levels in samples of apples, beet tops, cabbages, tomatoes, potatoes, hops, wines, and milk were at or near normal environmental levels.
Fish and Wildlife	Game animals on the site and along the Hanford Reach and fish from the Columbia River were monitored at 14 locations. Carcass, bone, and muscle samples were analyzed to evaluate radionuclide levels.	Samples of elk, pheasant, quail, deer, and Columbia River fish were collected and analyzed. Strontium-90 was the only radionuclide, possibly of Hanford origin, detected in 2000 and was found only in bone samples. Radionuclide levels in edible tissues were all below DOE detection limits with the exception of potassium-40, which is a naturally occurring radionuclide.
Effluent Monitoring	Liquid effluents and airborne emissions that may contain radioactive or hazardous constituents are continually monitored on the Hanford Site.	Some quantities of radionuclides were released to the environment at state and federally permitted release points. Tritium above natural background levels is released to the ground at the State-Approved Land Disposal facility in the 200 Areas under a state-approved discharge permit.
Hanford Wildfire, June 2000	Samples of air, soil, ash, farm products and natural vegetation were collected on or around the Hanford Site.	Although the fire may have resulted in the spread of small amounts of Hanford contaminants, all samples collected were well below regulatory limits.

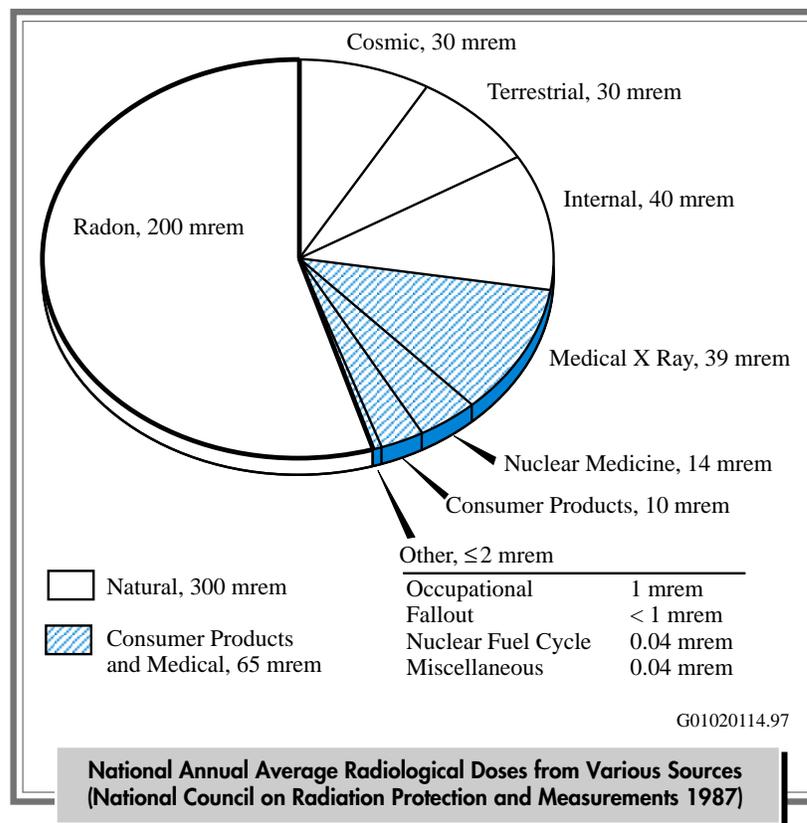




## Potential Radiological Doses from 2000 Hanford Operations

During 2000, potential radiological doses to the public and biota from Hanford operations were evaluated to determine compliance with pertinent regulations and limits. These doses were calculated using reported effluent releases and environmental surveillance data using version 1.485 GENII computer code and Hanford-specific parameters. The potential dose to the maximally exposed individual

in 2000 from site operations was 0.014 mrem compared to 0.008 mrem in 1999. To put this value into perspective, the national average dose from background sources, according to the National Council on Radiation Protection, is ~300 mrem/yr (3 mSv/yr), and the current DOE radiological dose limit for a member of the public is 100 mrem/yr (1 mSv/yr).



## Other Hanford Environmental Programs

### Climate and Meteorology

Meteorological measurements are taken to support Hanford Site emergency preparedness, site operations, and atmospheric dispersion

calculations. Weather forecasting and maintenance and distribution of climatological data are provided. The data are provided by the Hanford Meteorology Station, which is located on the 200 Areas plateau.

## **Cultural Resources**

Management of archaeological, historical, and traditional cultural resources at the Hanford Site complies with the requirements of various federal laws. During 2000, 113 cultural resource reviews were requested and conducted on the Hanford Site to comply with Section 106 of the *National Historic Preservation Act*.

Monitoring conducted during 2000 focused on four sites: Locke Island erosion, archaeological sites affected by visitors or nature, historic buildings, and places with Native American burials. A total of 96 archaeological sites, a building, and cemetery or burial locations were monitoring during 2000.

Public involvement is an important component of cultural resource management. To accomplish this goal, DOE developed mechanisms that allow the public access to cultural resources information and the ability to comment and make recommendations concerning the management of cultural resources on the Hanford Site. Native American involvement included the completion of several surveys, construction monitoring, and monthly meetings on cultural resource issues.

## **Community Operated Surveillance Program**

This program was initiated in 1990 to increase the public's involvement in and awareness of

Hanford's surveillance program. During 2000, nine radiological air sampling stations were operated by local teachers at selected locations around the site perimeter.

## **Quality Assurance**

Comprehensive quality assurance programs, which include various quality control practices and methods to verify data, are maintained to ensure data quality. The programs are implemented through quality assurance plans designed to meet requirements of the American National Standards Institute/American Society of Mechanical Engineers and DOE Orders. Quality assurance plans are maintained for all activities, and auditors verify conformance. Quality control methods include, but are not limited to, replicate sampling and analysis, analysis of field blanks and blind reference standards, participation in interlaboratory crosscheck studies, and splitting samples with other laboratories. Sample collection and laboratory analyses are conducted using documented and approved procedures. When sample results are received, they are screened for anomalous values by comparing them to recent results and historical data. Analytical laboratory performance on the submitted double blind samples, the EPA Laboratory Intercomparison Studies Program, and the national DOE Quality Assessment Program indicated that laboratory performance was adequate overall, was excellent in some areas, and needed improvement in others.

