

Summary of the

HANFORD SITE

ENVIRONMENTAL REPORT



for Calendar Year 2006

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HANFORD SITE
ENVIRONMENTAL REPORT
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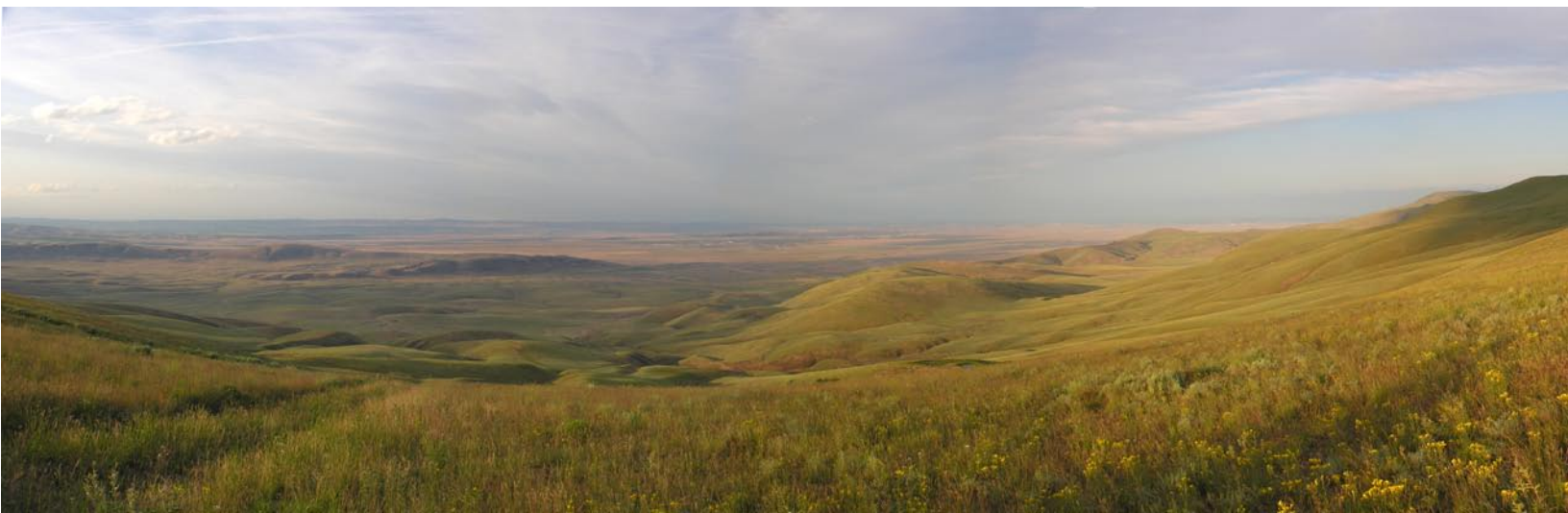
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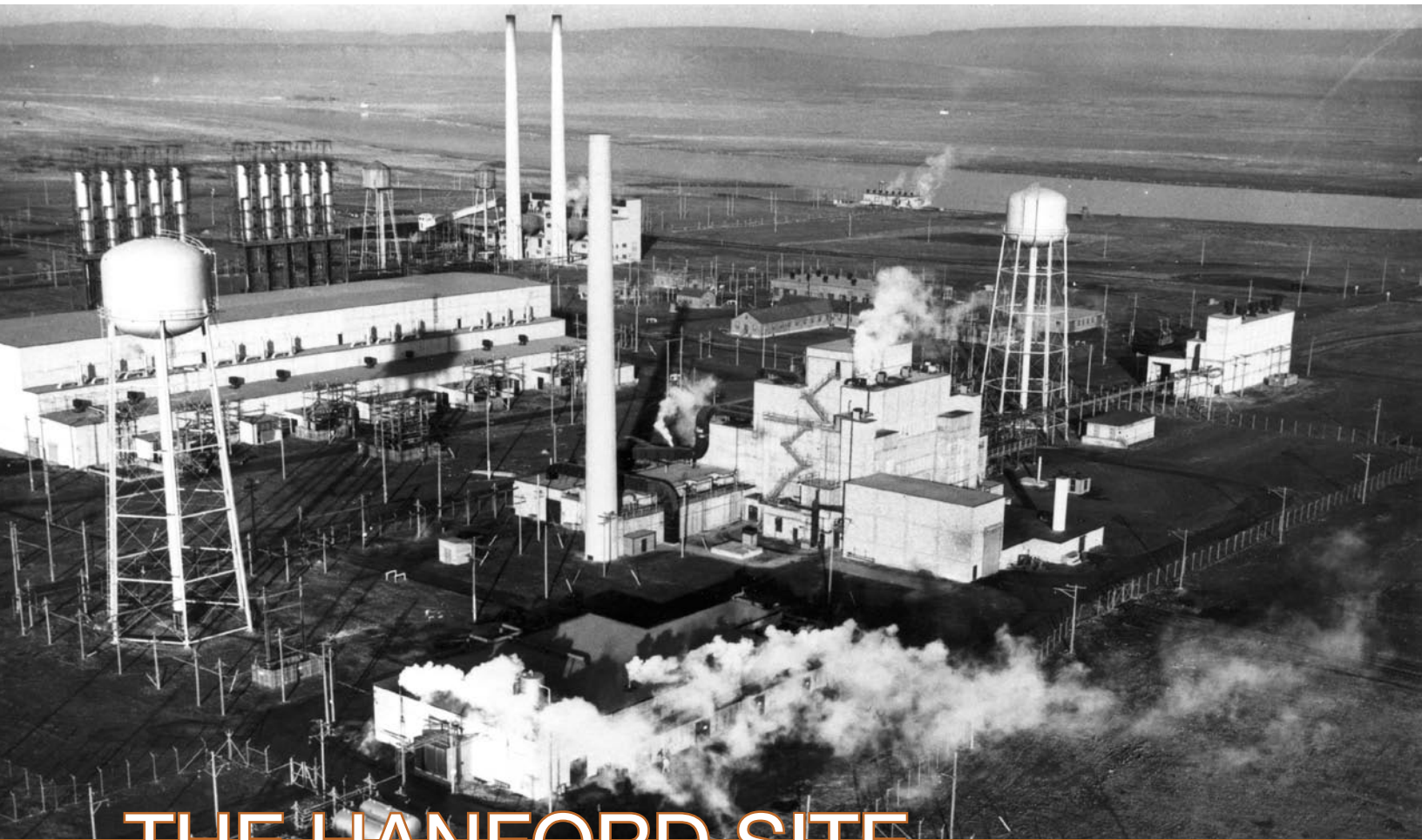


INTRODUCTION

The Hanford Site is a relatively undeveloped shrub and grassland ecosystem containing a rich diversity of plant and animal species.

This booklet summarizes the *Hanford Site Environmental Report for Calendar Year 2006*. The Hanford Site environmental report includes information and summary data that provide an overview of activities at the U.S. Department of Energy's (DOE) Hanford Site.

Included in this booklet are brief descriptions of the Hanford Site and its mission, the status and results of cleanup and facility decommissioning activities, environmental monitoring and surveillance programs and activities, and estimated radiological doses to the public and biota from 2006 Hanford Site activities. This booklet was written with a minimum of technical terminology. Readers interested in more detailed information can consult the 2006 Hanford Site environmental report or the technical documents cited and listed in that report. This booklet and the report are available online at <http://hanford-site.pnl.gov/envreport/>.



THE HANFORD SITE

AND ITS MISSION

B Reactor was operated at the Hanford Site for the first time in September 1944.

The Hanford Site was established in 1943 to produce plutonium for some of the nuclear weapons tested and used in World War II. Hanford was the first plutonium-production facility in the world. The site was selected by the U.S. Corps of Engineers because it was remote from major populated areas and had ample electrical power from Grand Coulee Dam, a functional railroad, clean water from the nearby Columbia River, and sand and gravel that could be used for constructing large concrete structures. Nine plutonium-production reactors were eventually constructed by the DOE on the site, along with facilities to separate and purify the reactor products into desirable forms. All of these reactors were shut down by 1987, and only one operated past the early 1970s.

In the late 1970s, the federal government constructed a liquid-sodium-cooled nuclear reactor on the site to test advanced nuclear fuels, materials,

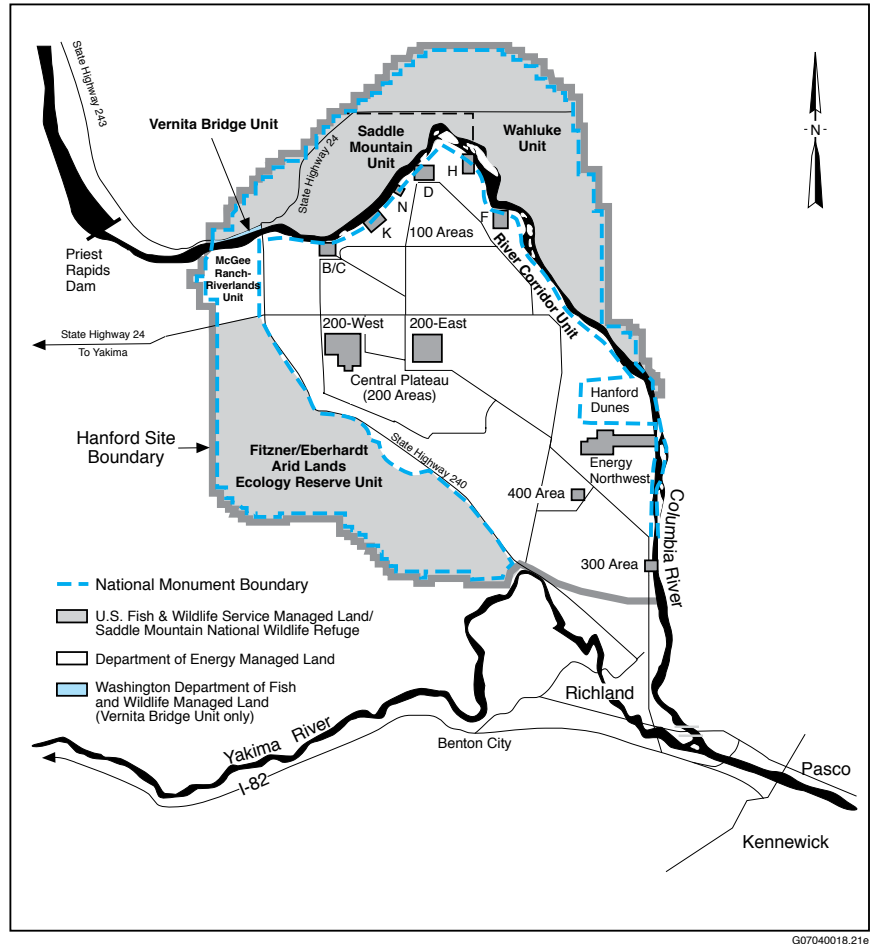
and components. This Fast Flux Text Facility reactor operated until April 1992 and deactivation and commissioning activities began in December 2001.

Non-DOE operations and activities on Hanford Site leased land include commercial power production by Energy Northwest at the Columbia Generating Station and operation of a commercial low-level radioactive waste burial site by US Ecology Washington, Inc. The Laser Interferometer Gravitational Wave Observatory (LIGO) is located west of the 400 Area and is operated jointly by the California and Massachusetts Institutes of Technology and sponsored by the National Science Foundation.

SITE DESCRIPTION

The Hanford Site lies within the semi-arid Pasco Basin of the Columbia Plateau in southeastern Washington State. It is a relatively undeveloped area of shrub-steppe habitat (a drought-resistant, shrub and grassland ecosystem) that contains a rich diversity of plant and animal species. The site occupies an area of approximately 586 square miles located north of the city of Richland. Public access to the site is restricted, and its large land area provides a buffer for the smaller areas on the site that historically were used for production of nuclear materials, waste storage, and waste disposal. The Columbia River flows eastward through the northern part of the Hanford Site and then turns south, forming part of the eastern site boundary.

In June 2000, the 305-square-mile Hanford Reach National Monument was established on the site by a Presidential Proclamation to protect the nation's only unimpounded stretch of the Columbia River above Bonneville Dam in the United States, and a remnant of the shrub-steppe ecosystem that once blanketed the Columbia River basin. In 2006, the DOE, U.S. Fish and Wildlife Service, and Washington Department of Fish and Wildlife each managed units of the monument.



This map shows management units on the Hanford Reach National Monument and the operational areas of the Hanford Site.

The Hanford Site lies within the semi-arid Pasco Basin of the Columbia Plateau in southeastern Washington State.



The Fitzner/Eberhardt Arid Lands Ecology Reserve is one unit of the Hanford Reach National Monument.

The major DOE operational, administrative, and research areas on and around the Hanford Site include the following:

- **100 Areas** – These areas are located along the south shore of the Columbia River. These are the sites of nine retired plutonium-production reactors.
- **200-West and 200-East Areas** – These areas are centrally located on the site’s Central Plateau. These areas were used for plutonium separation operations and waste storage, and are approximately 5 and 7 miles south and west of the Columbia River, respectively.
- **300 Area** – This area is located just north of the city of Richland. From the early 1940s until the advent of the cleanup mission, most research and development activities at the Hanford Site were performed in the 300 Area.
- **400 Area** – This area is located northwest of the 300 Area. The Fast Flux Test Facility (currently being decommissioned) is located in this area.
- **600 Area** – This area includes all of the Hanford Site not occupied by the 100, 200, 300, and 400 Areas.

HANFORD SITE AT A GLANCE

Location	The U.S. Department of Energy’s Hanford Site is located in southeastern Washington State near the city of Richland.
Dominant Features	Rattlesnake Mountain on the Fitzner/Eberhardt Arid Lands Ecology Reserve Unit of the Hanford Reach National Monument rises 3,525 feet above sea level, and the Columbia River flows through the northern part of the site.
Size	The site covers approximately 586 square miles.
Employees	The DOE and its contractors employ approximately 7,000 workers.
Mission	The Hanford Site mission is to safely clean up and manage the site’s facilities and waste, and reduce the size of the site by releasing the land for other uses.
Site Management	The DOE’s Richland Operations Office and Office of River Protection jointly manage the central portion of the Hanford Site through several contractors and their subcontractors. The DOE, U.S. Fish and Wildlife Service, and Washington Department of Fish and Wildlife each manage units of the Hanford Reach National Monument.

- **Former 1100 Area** – This area is located between the 300 Area and the city of Richland. In 1998, this area was transferred to the Port of Benton as part of the DOE's Richland Operations Office economic diversification efforts and is no longer part of the Hanford Site. DOE contractors continue to lease facilities in this area.
- **Richland North Area (off the site)** – This area includes the Pacific Northwest National Laboratory and other DOE and contractor facilities, mostly office buildings and laboratories in the northern part of the city of Richland.
- **700 Area (off the site)** – This area includes DOE administrative buildings in the central part of the city of Richland.
- **Volpentest Hazardous Materials Management and Emergency Response Training and Education Center (also called HAMMER)** – This worker safety-training facility is located on the site near the city of Richland. It consists of an 80-acre main site and a 10,000-acre law enforcement and security-training site.

The DOE's primary mission at the Hanford Site is to clean up contamination and facilities left from historical operations.

HANFORD SITE MISSION

For more than 40 years, Hanford Site facilities were dedicated primarily to the production of plutonium for national defense and management of the resulting waste. In recent years, efforts at the site have focused on developing new waste treatment and disposal technologies and characterizing and cleaning up contamination and facilities left from historical operations. Physical challenges at the Hanford Site include managing or cleaning up millions of gallons of highly radioactive liquid waste in 177 underground storage tanks, 2,300 tons of spent nuclear fuel, 9 tons of plutonium in various forms,



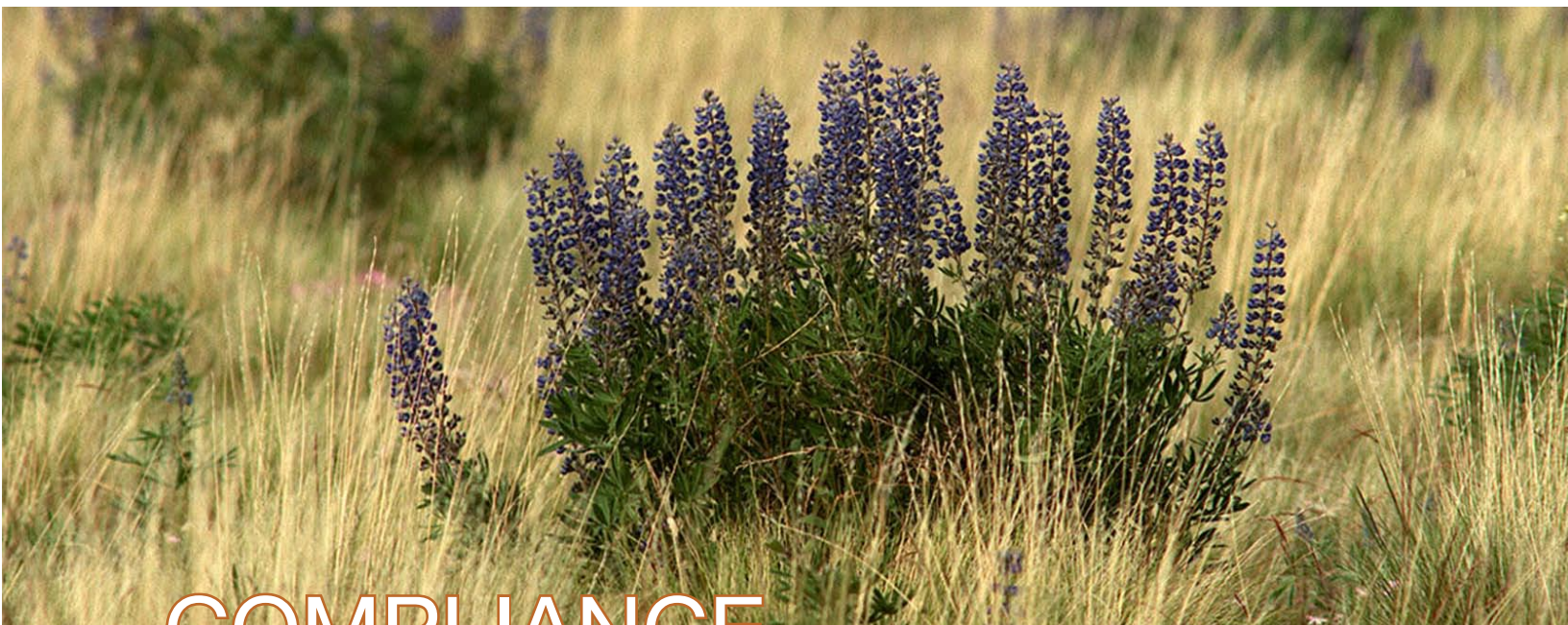
The cities of Kennewick (left), Pasco (right), and Richland (in the distance) are located to the south and east of the Hanford Site.

about 25 million cubic feet of buried or stored solid waste, more than 1,700 former waste-disposal sites, and about 500 contaminated facilities.

Currently, the DOE's primary mission is to accelerate completion of waste cleanup. The *Performance Management Plan for the Accelerated Cleanup of the Hanford Site* states that the cleanup mission includes the following strategies:

- Restoring the Columbia River corridor by accelerating the cleanup of Hanford Site sources of radiological and chemical contamination that threaten the air, groundwater, or Columbia River. It is expected that most river corridor projects will be completed by 2012.
- Ending the tank waste program by 2033 by accelerating waste retrieval, increasing the capacity of the Waste Treatment Plant (under construction), and continuing the process of closing underground waste storage tanks.
- Accelerating treatment and disposal of mixed low-level waste and the retrieval of transuranic waste and its shipment off the site.
- Accelerating cleanup of excess facilities on the Central Plateau (200-East and 200-West Areas).
- Accelerating cleanup and protection of groundwater beneath the Hanford Site.

The DOE Richland Operations Office and DOE Office of River Protection jointly manage the Hanford Site through several contractors and their subcontractors. The DOE Richland Operations Office manages the cleanup of waste from historical operations, research, and other programs at the Hanford Site. The DOE Office of River Protection manages the DOE's largest, most complex environmental cleanup project – retrieval, treatment, and disposal of tank waste at the Hanford Site.



COMPLIANCE

WITH ENVIRONMENTAL REGULATIONS

Lupine is a common flowering plant on portions of the Hanford Site.

Several federal, state, and local government agencies monitor and enforce compliance with applicable environmental regulations at the Hanford Site. Major agencies include the U.S. Environmental Protection Agency (EPA), Washington State Department of Ecology, Washington State Department of Health, and Benton Clean Air Authority. These agencies issue permits, review compliance reports, participate in joint monitoring programs, inspect facilities and operations, and/or oversee compliance with regulations. Both the DOE Richland Operations Office and DOE Office of River Protection recognize the importance of maintaining a program of self-assessment and regulatory reporting to assure that environmental compliance is achieved and maintained at the Hanford Site.

The site's compliance with federal acts in 2006 is summarized in the following table.

COMPLIANCE WITH FEDERAL ACTS AT THE HANFORD SITE IN 2006

<u>Regulation</u>	<u>What It Covers</u>	<u>2006 Status</u>
<i>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</i>	Cultural resources.	During 2006, 166 cultural resource reviews were requested on the Hanford Site. The DOE determined that 144 activities would not affect cultural resources and were exempt from further review; 6 requests were exempted from full cultural review by programmatic agreement; 16 requests required full reviews. Seventeen sites were visited in 2006 to assess the effects of erosion, weathering, and unauthorized excavation and collection. Three new archaeological sites and three new isolated finds were recorded on the Hanford Site in 2006. Excavations were conducted at two other locations to collect data.
<i>Atomic Energy Act</i>	Proper management of radioactive materials.	In 2006, the DOE issued a manual and a guidance document that potentially impact the management and control of radioactive materials. In addition, a DOE technical standard pertaining to the management and control of radioactive materials was significantly revised in 2006.
<i>Clean Air Act</i>	Air quality, including emissions from facilities and from unmonitored sources.	The Hanford Site air operating permit was reissued by the Washington State Department of Ecology in December 2006. The Benton Clear Air Authority regulates open-air burning and oversees the site's compliance with asbestos regulations. In 2006, 22 <i>Clean Air Act</i> enforcement inspections were conducted on the Hanford Site.
<i>Clean Water Act</i>	Point-source discharges to U.S. surface waters.	The Hanford Site has one National Pollutant Discharge Elimination System Permit, one storm water permit, and several state sanitary wastewater discharge permits. There were no permit violations in 2006.
<i>Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)</i>	Sites already contaminated by hazardous materials.	Several CERCLA records of decision required reviews of institutional controls for specific areas covered by the records of decision. These reviews were conducted in 2006. There were no CERCLA or <i>Washington Administrative Code</i> (WAC) reportable spills or non-permitted discharges from the Hanford Site during calendar year 2006.
<i>Emergency Planning & Community Right to Know Act</i>	The public's right to information about hazardous materials in the community and establishes emergency planning procedures.	The <i>2006 Hanford Site Tier Two Emergency and Hazardous Chemical Inventory</i> was issued to the Washington State Department of Ecology, local emergency planning committees, and the fire departments of the Hanford Site and the city of Richland. The <i>2006 Hanford Site Toxic Chemical Release Inventory</i> is scheduled for release in 2007.
<i>Endangered Species Act</i>	Rare species of plants and animals.	Numerous plants and animals at the Hanford Site are state or federally listed as endangered, threatened, sensitive, or candidate species. Ecological compliance reviews are conducted prior to initiating a project at the Hanford Site to prevent adverse impacts to biological resources, including listed species. In 2006, 188 reviews were performed. Also in 2006, two informal meetings were held (one each) with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service to discuss <i>Endangered Species Act</i> issues.

COMPLIANCE WITH FEDERAL ACTS AT THE HANFORD SITE IN 2006

<u>Regulation</u>	<u>What It Covers</u>	<u>2006 Status</u>
<i>Federal Insecticide, Fungicide, and Rodenticide Act</i>	Storage and use of pesticides.	At the Hanford Site, pesticides are applied by commercial pesticide operators licensed by the state.
<i>Migratory Bird Treaty Act</i>	Migratory birds or their feathers, eggs, or nests.	All Hanford Site projects with a potential to affect federal- or state-listed species of concern complied with the requirements of this act by using an ecological compliance review to minimize adverse impacts to migratory birds.
<i>National Environmental Policy Act</i>	Environmental impact statements for major federal projects that have the potential to significantly affect the quality of the human environment.	In February 2006, the DOE announced its intention to prepare a new environmental impact statement titled <i>Notice of Intent to Prepare the Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA</i> . Four public scoping meetings for this impact statement were held in 2006. The U.S. Fish and Wildlife Service issued a document for review in December 2006 titled <i>Draft Hanford Reach National Monument Comprehensive Conservation Plan and Environmental Impact Statement</i> . The DOE Richland Operations Office is co-manager of the monument and a cooperating agency in preparing this impact statement.
<i>Resource Conservation and Recovery Act (RCRA)</i>	Tracking hazardous waste from generator to treatment, storage, or disposal (referred to as cradle-to-grave management).	The DOE is operating under an expired facility RCRA permit at the Hanford Site while the Washington State Department of Ecology drafts a new permit. During 2006, four revisions to the RCRA Permit Part A Form and four RCRA Part B Permit applications were submitted to the state for review and approval. One RCRA non-compliance document was received at the Hanford Site in 2006 alleging that the DOE failed to submit a complete application for a new RCRA permit. The DOE responded and is awaiting a reply from the state.
<i>Safe Drinking Water Act</i>	Drinking water systems operated by the DOE at the Hanford Site.	There were nine public drinking water systems on the Hanford Site in 2006. The systems were monitored for radiological and chemical contaminants and disinfectant residuals and disinfection byproducts. All contaminant concentrations in 2006 were below state and federal limits. There were three total-coliform detections in 2006 but follow-up sampling and analyses yielded satisfactory results.
<i>Toxic Substances Control Act</i>	Primarily regulation of polychlorinated biphenyls (PCBs).	The <i>2005 Polychlorinated Biphenyl Annual Document Log – Report for the Hanford Site</i> and a 2005 PCB annual report were submitted to the EPA in 2006 as required. EPA-approved risk-based disposal approvals were used in 2006 for retrieving waste from selected single-shell underground waste storage tanks and for removing containers of treated sludge from the K Basin North Load-Out Pit. In 2006, a risk-based disposal approval application was submitted for storage of two water tower tanks on the Hanford Site that contain PCB-contaminated paint.



HANFORD SITE CLEANUP

The 100-K Area in 2006.

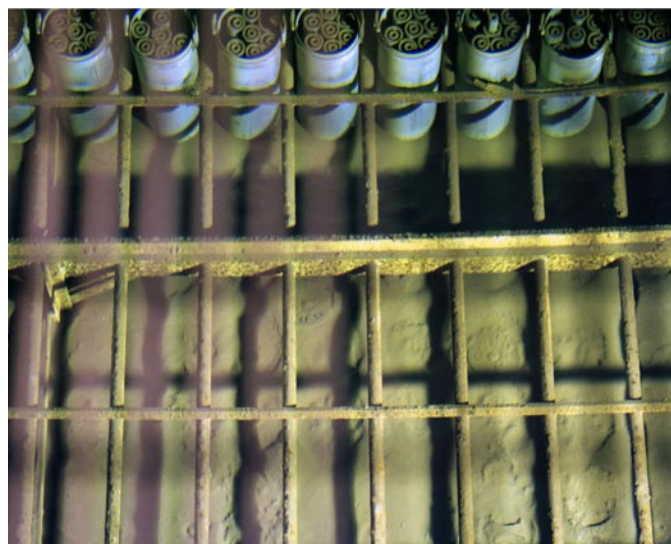
Hanford Site cleanup includes remediation of former waste-disposal sites and decommissioning of inactive facilities.

CLEANUP OPERATIONS IN 2006

Since cleanup activities began at the Hanford Site, the primary focus has been on former liquid effluent waste-disposal sites. After nearly 10 years of work, the number of liquid effluent waste-disposal sites requiring remediation has been reduced, and cleanup activities are now turning to remediation of waste burial grounds. The volume of contamination in waste burial grounds is less than in liquid effluent waste-disposal sites; however, the burial grounds may

contain unknown materials and additional time may be required to characterize the materials and dispose of them properly.

Remediation of Waste Sites in the 100 Areas. Full-scale remediation of waste sites began in the 100 Areas in 1996. In 2006, remediation focused on waste burial grounds and miscellaneous waste sites in the 100-B, 100-K, 100-N, 100-D, and 100-F Areas. A total of 393,548 tons of contaminated soil from 100 Area's remediation activities was disposed of at the Environmental Restoration Disposal Facility (near the 200-West Area) during 2006. The bulk of the contaminated soil was from the 100-B and 100-F Areas. Several cleaned up waste sites in the 100-B, 100-K, and 100-N Areas were revegetated with native grass seed and sagebrush seedlings in 2006.



Prior to cleanup, the K Basins contained irradiated fuel rods and sludge.

K Basins Closure Activities. During 2006, workers continued to clean out the K Basins, which are two indoor, concrete pools attached to the now-closed

SUMMARY OF GROUNDWATER REMEDIATION ACTIVITIES

<u>Location</u>	<u>Startup Date</u>	<u>Contaminant</u>	<u>Mass Removed 2006</u>	<u>Mass Removed Since Startup</u>
100-D Area (100-DR-5 Pump-and-Treat System)	2004	Chromium	142 pounds	235 pounds
100-D and 100-H Areas (100-HR-3 Pump-and-Treat System)	1997	Chromium	63 pounds	661 pounds
100-K Area (100-KR-4 Pump-and-Treat System)	1997	Chromium	46 pounds	670 pounds
100-N Area (100-NR-2 Pump-and-Treat System)	1995	Strontium-90	0.04 curies	1.83 curies
200-West Area (200-ZP-1 Pump-and-Treat System)	1994	Carbon tetrachloride	1,962 pounds	22,970 pounds
200-West Area (200-UP-1 Pump-and-Treat System)	1994	Carbon tetrachloride	None	76.3 pounds
		Nitrate	None	76,534 pounds
		Technetium-99	None	0.262 pound
		Uranium	None	467 pounds
Waste Management Area S-SX	2003	Technetium-99	~0.003 ounce	0.01 ounce
200-West Area (Soil-Vapor Extraction System)	1991	Carbon tetrachloride	381 pounds	174,000 pounds



Remediation and decommissioning activities were conducted in the 300 Area in 2006.



Decommissioning of facilities in the 100-N Area was a priority during 2006.

K-East and K-West Reactors. For nearly 30 years, these basins contained 2,300 tons of Hanford Site N Reactor spent fuel and a small quantity of irradiated single-pass reactor fuel from older site reactors. This fuel was removed in a major effort that ended in 2004 but fuel corrosion left behind approximately 70 cubic yards of sludge. In addition, the K Basins contained more than 300 tons of debris. During 2006, all debris was removed, packaged, and readied for shipment to Hanford's Environmental Restoration Disposal Facility; all remaining sludge was removed from the K Basins and containerized.

Remediation of Waste Sites in the 200 Areas. Remedial investigation or feasibility study activities continued during 2006 at waste sites in the 200 Areas that are grouped into a number of CERCLA operable unit groups.

Remediation of Waste Sites in the 300 Area. In 2006, 54,063 tons of contaminated soil from 300 Area waste sites were removed and disposed of at Hanford's Environmental Restoration Disposal Facility. A design solution for cleaning up the 618-10 and 618-11 burial grounds was submitted to the DOE in December 2006 for evaluation. Several cleaned and backfilled 300 Area waste sites were revegetated in 2006.

FACILITY DECOMMISSIONING ACTIVITIES IN 2006

Decommissioning of Facilities in the 100 Areas. Decontamination and decommissioning activities focused on the 100-N Area in 2006, where more than 20 facilities were demolished.

Decommissioning of Facilities in the 200 Areas. Activities to decontaminate and deactivate the processing facilities at the Plutonium Finishing Plant continued. Surveillance, maintenance, and decontamination or stabilization of over 500 waste sites in the 200-East, 200-West, and 200-North Areas, and a few waste sites on the Fitzner/Eberhardt Arid Lands Ecology Reserve Unit, continued. Periodic surveillances, radiation surveys, and herbicide applications were performed. The 221-U Facility (U Plant) was selected for demolition using a close in place – collapsed structure alternative (referred to as the Canyon Disposition Initiative). This cleanup effort will be a prototype for the other four canyon buildings at the Hanford Site.

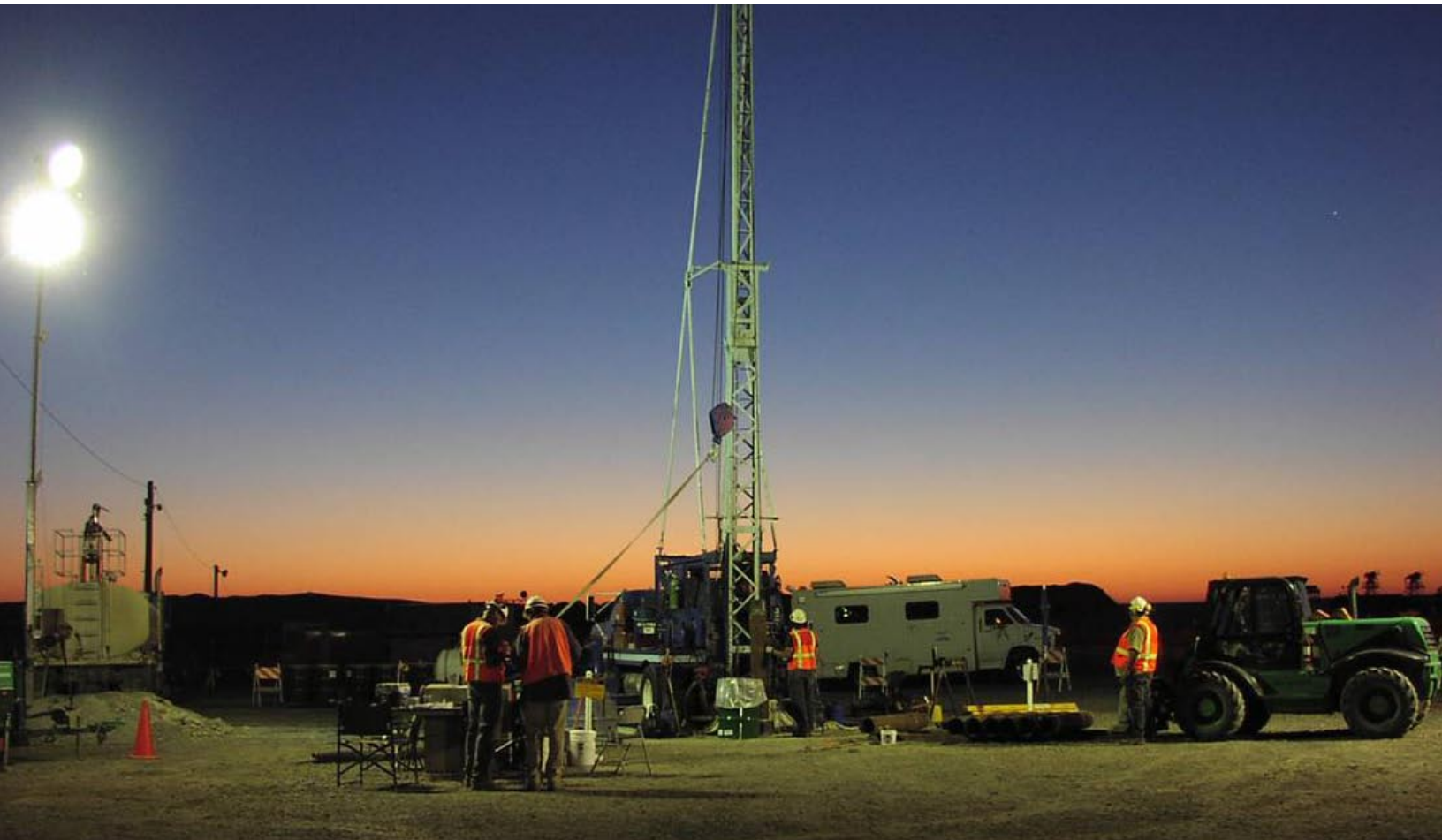
Decommissioning of Facilities in the 300 Area. During 2006, 300 Area deactivation, decontamination, decommissioning, and demolition activities focused on removing facilities and buildings. More than 30 facilities and buildings were demolished in the 300 Area in 2006.

Decommissioning of Facilities in the 400 Area – Fast Flux Test Facility. After multiple studies, a final decision was made to complete facility deactivation, including removing all nuclear fuel, draining the liquid-sodium systems, and deactivating systems and equipment to place the facility in a low-cost, long-term surveillance and maintenance condition by September 2009. During 2006, fuel removal from the 400 Area Property Protected Area continued. Eight interim-storage casks with fuel were transferred to the 200 Areas Interim Storage Area. Draining of bulk-liquid sodium metal from the Fast Flux Test Facility also continued in 2006. Materials were removed and equipment dismantled in the Interim Examination and Maintenance Cell Training Facility in preparation for demolition.

What is decommissioning?

When the DOE declares a facility as surplus (no longer needed), it is shut down and prepared for decontamination and decommissioning (D&D). The process is the safe decontamination, dismantling, removal of contamination and structures, and/or the release for reuse of facilities that are no longer active. The DOE is conducting D&D activities on reactors, processing plants, storage tanks, laboratory facilities, and other structures. Decontamination and decommissioning presents many challenges. Work continues at the Hanford Site to decommission facilities in the operational areas.

Adapted from
<http://www.web.em.doe.gov/empriemerdd.html>



WASTE MANAGEMENT

Four deep boreholes were drilled at the Waste Treatment Plant construction site in 2006 to study how seismic shock waves move through rock and sediment.

Hanford Site cleanup activities generate non-regulated, radioactive, non-radioactive, mixed, and hazardous waste. Mixed waste has both radioactive and hazardous non-radioactive substances. Hazardous waste contains either dangerous waste or extremely hazardous waste, or both. This waste is handled and prepared for safe storage at the site or shipped to offsite facilities for treatment and disposal.

In addition to newly generated waste, significant quantities of waste remains from years of nuclear materials production and waste management activities. Most waste from past operations at the Hanford Site resides in underground storage tanks and in former waste-disposal sites, or is temporarily stored until it can be cleaned up, disposed of, or placed in permanent safe storage.

Management of Solid Waste. Waste management at the Hanford Site in 2006 included the treatment, storage, and disposal of solid waste. Onsite solid-waste facilities include the Central Waste Complex, Waste Receiving and Processing Facility, T Plant complex, Environmental Restoration Disposal Facility, Radioactive Mixed Waste Disposal Facility, and low-level burial grounds.

The Central Waste Complex can store as much as 27,200 cubic yards of waste. This capacity is adequate to store the projected volumes of low-level, transuranic, and mixed waste, and radioactively contaminated polychlorinated biphenyls (PCBs) to be generated from Hanford Site cleanup activities assuming on-schedule treatment of the stored waste. Treatment will reduce the amount of waste in storage and make room for newly generated mixed waste. The current volume of waste stored at this complex totals approximately 9,100 cubic yards.

Waste destined for the Waste Receiving and Processing Facility includes stored waste as well as newly generated waste from current site cleanup activities. The waste consists primarily of contaminated cloth, paper, rubber, metal, and plastic. This facility treated and shipped offsite 767 cubic yards of waste in 2006.

During 2006, there were 1,292 cubic yards of mixed low-level waste treated or disposed of at the Mixed Low-Level Waste Treatment and Disposal Facility.

There was one defueled reactor compartment from the U.S. Navy shipped to trench 94 in the 200-East Area in 2006. The total number of Navy reactor compartments received to date is 115.

During 2006, approximately 524,474 tons of cleanup waste were disposed of at the Environmental Restoration Disposal Facility. Approximately 6.8 million tons of remediation waste have been placed in the Environmental Restoration Disposal Facility from initial operations start-up through 2006.

The Radioactive Mixed Waste Disposal Facility consists of two trenches in the 200-West Area. The first waste layer in the first trench has been completed and covered with sand and gravel. The second waste layer has been started. Currently, there are approximately 5,244 cubic yards of waste in the first trench. There are approximately 383 cubic yards of waste in the second trench.



A defueled U.S. Navy reactor compartment is transported to the Hanford Site's 200-East Area for disposal.

HANFORD SITE WASTE SUMMARY 2006

Activity	Waste Type	Amount
Solid waste generated during onsite cleanup activities	Mixed waste	347 tons
	Radioactive waste	513 tons
Solid waste received at Hanford from off the site	Mixed waste	168 tons
	Radioactive waste	79 tons
Dangerous waste shipped off the Hanford Site	Containerized waste	21 tons
	Bulk solids	0
	Bulk liquids	1 ton
Waste volume pumped from underground single-shell waste storage tanks to double-shell waste storage tanks	Liquid waste	780,000 gallons
Waste volume in underground single-shell waste storage tanks at the end of 2006	Liquid waste	30 million gallons
Waste volume evaporated at the 242-A evaporator	Liquid waste	238,000 gallons
Waste added to underground double-shell waste storage tanks	Liquid waste	937,000 gallons
Waste volume in underground double-shell waste storage tanks at the end of 2006	Liquid waste	27 million gallons
Waste dispositioned and shipped offsite from the Waste Receiving and Processing Facility	Solid waste	767 cubic yards
Waste treated or directly disposed of at the Mixed Low-Level Waste Treatment and Disposal Facility	Mixed low-level solid waste	1,292 cubic yards
Waste disposed of at the Environmental Restoration Disposal Facility	Solid waste	524,474 tons
Volume of aqueous waste received at the Liquid Effluent Retention Facility	Wastewater containing low levels of organic compounds and tritium	1.87 million gallons
Volume of liquid effluent treated at the Effluent Treatment Facility	Wastewater containing toxic metals, radionuclides, ammonia, and organic compounds	4.13 million gallons
Volume of wastewater treated at the 242-A evaporator	Liquid waste from single-shell tanks	553,400 gallons
Volume of effluent disposed of at the 200 Area Treated Effluent Disposal Facility	Uncontaminated liquid waste	202.2 million gallons
Volume of wastewater treated and disposed of at the 300 Area Treated Effluent Disposal Facility	Industrial wastewater	36.87 million gallons

Thirty million gallons of waste were stored in single-shell underground waste storage tanks at the end of 2006.

The low-level burial grounds consist of eight burial grounds located in the 200-East and 200-West Areas that are used for the disposal of low-level waste and mixed waste (i.e., low-level radioactive waste with a dangerous waste component).

Management of Liquid Waste. Liquid effluent is stored, treated, or disposed of in facilities that comply with federal and state regulations and facility permits.

The Effluent Treatment Facility, in the 200-East Area, treats liquid effluent to remove toxic metals, radionuclides, and ammonia, and destroy organic compounds. The treated effluent is stored in tanks, sampled and analyzed, and discharged onsite to the State-Approved Land Disposal Site. The volume of wastewater treated and disposed of in 2006 was approximately 4.13 million gallons.

Approximately 8.30 million gallons of liquid waste were stored at the Liquid Effluent Retention Facility at the end of 2006. The volume of wastewater transferred to this facility for storage in 2006 was approximately 4.13 million gallons.

In 2006, 202.2 million gallons of uncontaminated effluent were disposed of at the 200 Area Treated Effluent Disposal Facility. This facility consists of buried pipelines, three pumping stations, and two 5-acre ponds located east of the 200-East Area. The major source of this effluent was uncontaminated cooling water and steam condensate from the 242-A evaporator.

Industrial wastewater generated throughout the Hanford Site is collected and treated in the 300 Area Treated Effluent Disposal Facility. The wastewater consists of cooling water, steam condensate, and other industrial wastewater. The volume of industrial wastewater treated and disposed of during 2006 was 36.87 million gallons.

The 242-A evaporator in the 200-East Area concentrates diluted liquid waste from single-shell underground waste storage tanks, by evaporation. This reduces the volume of liquid waste sent to the double-shell tanks for storage and reduces the potential need for more double-shell tanks. The 242-A evaporator completed a cold-run campaign for training purposes and one waste campaign in 2006. The volume of waste treated was 553,400 gallons, reducing the waste volume by 238,200 gallons, or approximately 43% of the total volume. The volume of process condensate transferred to the Liquid Effluent Retention Facility for subsequent treatment in the Effluent Treatment Facility was 330,000 gallons.

Underground Waste Storage Tanks. During 2006, 780,000 gallons of waste were pumped from single-shell to double-shell tanks. At the end of 2006, there were 26.8 million gallons of waste in the double-shell tanks.

Hanford Waste Treatment and Immobilization Plant (Waste Treatment Plant). The Hanford Waste Treatment and Immobilization Plant (Waste Treatment Plant) is being built on 65 acres located adjacent to the 200-East Area. This plant will treat radioactive and hazardous waste stored in 177 underground tanks. Four major facilities are being constructed: a pretreatment facility, a high-level waste vitrification facility, a low-activity waste vitrification facility, and an analytical laboratory. Supporting facilities are also being constructed.



Solidified waste material occurs inside some of Hanford's underground waste storage tanks.



Construction on the Waste Treatment Plant continued during 2006.

Construction on these facilities continued in 2006, although the technical challenges associated with designing and building a first-of-its-kind project, coupled with overcoming stagnation of the U.S. nuclear industry, led to major changes in the project's execution plan and the development of a new schedule.

WASHINGTON STATE INITIATIVE 297: *CLEANUP PRIORITY ACT*

The *Cleanup Priority Act* was passed by Washington State voters in November 2004. In December 2004, the U.S. Department of Justice sought and received a temporary restraining order from the U.S. District Court that prohibited application or enforcement of the act at the Hanford Site or Pacific Northwest National Laboratory, except to the extent it prohibited import of mixed waste to the site. The U.S. Department of Justice filed a motion for summary judgment arguing the *Cleanup Priority Act* is preempted by federal law, violates the principle of sovereign immunity, and burdens the flow of interstate commerce in violation of the U.S. Constitution. In February 2005, Washington State officials asked the federal court to certify five issues for interpretation by the Washington State Supreme Court. The federal court agreed and then prohibited application of the entire initiative, including waste importation prohibitions, until all claims are resolved in both federal and state courts. In 2006, the federal court ruled the initiative was "invalid in its entirety" because it violated the U.S. Constitution in several areas. Washington State officials appealed the ruling in late 2006; no date for oral argument had been set as of April 2007.



One hundred forty tons of mixed office paper and cardboard were recycled in 2006.

POLLUTION PREVENTION AND WASTE MINIMIZATION

The Pollution Prevention and Waste Minimization Program is an organized and continuing effort to reduce the quantity and toxicity of hazardous, radioactive, mixed, and sanitary waste generated at the Hanford Site.

Affirmative procurement (the purchase of environmentally preferable products containing recycled material) at the Hanford Site achieved 100% of the 2006 goal.

In 2006, 1,230 tons of sanitary and hazardous wastes were recycled. This recycled waste included 140 tons of mixed office paper and cardboard, 455 tons of iron/steel, 59 tons of non-ferrous metal, 277 tons of PCB oil, and 90 tons of computers and electronics.



ENVIRONMENTAL AND RESOURCE PROTECTION PROGRAMS

The 300 Area (foreground) is located west of the Columbia River just north of the city of Richland.

DOE Orders require that emission, effluent, and environmental monitoring programs be conducted at the Hanford Site to verify protection of the site's environmental and cultural resources, the public, and workers on the site, and to comply with government regulations.

AIR EMISSIONS

Hanford Site contractors monitor airborne emissions from site facilities to assess the effectiveness of emission treatment and control systems, pollution management practices, and to determine compliance with state and federal

Concentrations of radioactive materials in air are monitored continuously on and off the Hanford Site.

regulatory requirements. Small quantities of tritium, strontium-90, iodine-129, cesium-137, plutonium-238, plutonium-239/240, plutonium-241, americium-241, and a few other isotopes are released in the 100, 200, 300, 400, and 600 Areas of the Hanford Site.

Non-radioactive air pollutants are emitted from power-generating and chemical-processing facilities. These facilities are monitored when activities are known to generate potential pollutants of concern, which include gaseous ammonia, particulate matter, sulfur oxides, nitrogen oxides, volatile organic compounds, carbon monoxide, and lead.

AMBIENT-AIR MONITORING

Radioactive constituents in air are monitored on the Hanford Site near facilities and operations, at site-wide locations away from facilities, and offsite around the perimeter of the site and in nearby and distant communities.

Ambient-Air Monitoring Near Facilities and Operations. In 2006, ambient air was monitored at 77 locations on the Hanford Site near facilities and operations. Samplers were located primarily at or within approximately 1,640 feet

of sites or facilities having the potential for, or a history of, environmental releases. Samples collected from locations at or directly adjacent to Hanford Site facilities had higher radionuclide concentrations than did samples collected farther away. In general, radionuclide concentrations in most Hanford Site near-facility samples were greater than levels measured in samples collected offsite. However, radionuclide concentrations in all 2006 samples were near background levels and much less than EPA limits.



Air samplers on the site were located primarily around major operational areas to maximize the ability to detect radiological contaminants resulting from site operations.

Ambient-Air Monitoring at Site-Wide and Offsite Locations. During 2006, samples were collected at 42 continuously operating site-wide and offsite locations: 23 onsite (site-wide), 11 at site perimeter locations, 7 in nearby communities, and 1 in a distant community.

Airborne particle samples were collected at each station biweekly and monitored for gross alpha and gross beta concentrations. Biweekly samples were combined into quarterly composite samples and analyzed for gamma-emitting radionuclides. At 20 locations, samples of atmospheric water vapor were collected every four weeks and analyzed for tritium. All sample results showed very low radiological concentrations in 2006. All radionuclide concentrations in air samples collected in 2006 were low enough to be below the *Clean Air Act* dose standard of 10 millirem per year.

LIQUID EFFLUENT MONITORING

Liquid effluent streams from Hanford Site facilities are sampled for gross alpha and gross beta concentrations, as well as for concentrations of selected radionuclides. In 2006, only facilities in the 200 Areas discharged radioactive liquid effluent (containing tritium only) to the ground at a single location, the State-Approved Land Disposal Site. Non-radioactive hazardous materials in liquid effluent are monitored in the 100, 200, 300, and 400 Areas. The effluent is discharged to the State-Approved Land Disposal Site and to the Columbia River. Effluent entering the environment at designated discharge points is sampled and analyzed to determine compliance with applicable Hanford Site discharge permits.

SURFACE-WATER AND SEDIMENT MONITORING

Samples of surface water and sediment on and near the Hanford Site were collected and analyzed to determine the concentrations of radiological and chemical contaminants from the Hanford Site. Surface water bodies included the Columbia River, onsite ponds, and offsite irrigation sources. Aquatic sediment was collected from the Columbia River and one onsite pond.

Water from the Columbia River. During 2006, Columbia River water samples were collected with automated samplers at fixed-location monitoring stations at Priest Rapids Dam and at Richland, Washington (analyzed for radionuclides), and from cross-river transects and near-shore locations near the Vernita Bridge, 100-N Area, Hanford town site, 300 Area, and the city of Richland (analyzed for both radionuclides and chemicals). Radiological constituents of interest included gamma-emitting radionuclides, tritium, strontium-90, technetium-99, uranium-234, uranium-235, uranium-238, plutonium-238, and plutonium-239/240. Gross beta and gross alpha concentrations were also monitored. Chemicals of interest included metals and anions.



The Columbia River flows through the northern portion of the Hanford Site and forms part of the site's eastern boundary.

HANFORD SITE MONITORING RESULTS FOR 2006

	<u>What Was Monitored?</u>	<u>The Bottom Line</u>
Air	Radioactive and non-radioactive emissions were monitored at Hanford Site facilities. Air particles and gases were monitored for radioactivity onsite near facilities and offsite. Air samples were collected at 77 locations near Hanford Site facilities, at 23 locations around the Hanford Site away from facilities, at 11 site perimeter locations, and at 8 community locations.	All measurements of radioactive materials in air were below recommended guidelines. In general, radionuclide concentrations near facilities were at or near Hanford Site background levels, and were much less than DOE-derived concentration guides. Some Hanford Site values were greater than concentrations measured offsite. The data also show that concentrations of certain radionuclides were higher and widely variable within different onsite operational areas.
Columbia River Water and Sediment	Columbia River water and sediment samples were collected from multiple Hanford Reach sampling points and from locations upstream and downstream of the Hanford Site. The samples were analyzed for radioactive and chemical materials.	As in past years, small amounts of radioactive materials were detected downriver from the Hanford Site. However, the amounts were far below federal and state limits. During 2006, there was no indication of any deterioration of Columbia River water or sediment quality resulting from operations at the Hanford Site.
Columbia River Shoreline Spring Water and Sediment	Groundwater beneath the Hanford Site discharges to the Columbia River along the Hanford Site shoreline. Discharges above the water level of the river are identified as shoreline springs. Samples of spring water and sediment were collected at locations along the Hanford Site shoreline of the Columbia River.	Samples collected at the shoreline springs contained some contaminants at levels above those observed in near-shore river water but similar to Hanford Site groundwater. However, concentrations in river water downstream of the shoreline springs remained far below federal and state limits. Contaminant concentrations in sediment samples from shoreline springs were similar to background levels, except for uranium concentrations at the 300 Area, which were above background levels.
Food and Farm Products	Samples of asparagus, apples, leafy vegetables, milk, potatoes, tomatoes, and wine were collected from locations upwind and downwind of the Hanford Site.	Radionuclide concentrations in samples of food and farm products were at normal environmental levels.
Fish and Wildlife	Game animals and other animals of interest on the Hanford Site and fish from the Hanford Reach of the Columbia River were monitored. Carcass, liver, and muscle samples were analyzed to evaluate radionuclide and metals concentrations. Populations of selected fish and wildlife species were also surveyed or monitored.	Samples of carp, sucker, quail, and deer were collected and analyzed. Radionuclide levels in wildlife samples were well below levels that are estimated to cause adverse health effects to animals or to the people who may consume them. Concentrations of 17 trace metals were similar to concentrations measured in samples from background locations.
Soil	Ninety-seven routine soil samples were collected onsite near facilities and operations in 2006 to verify known radiological conditions. There were also soil samples collected to investigate potential contamination at non-routine sampling locations in 2006.	In general, radionuclide concentrations in routine samples collected from or adjacent to waste-disposal facilities in 2006 were higher than concentrations measured in distant communities in 2004. There were 25 instances of radiological contamination in soil samples investigated in 2006. Of the 25, 22 were cleaned up. The contamination levels at the other locations did not exceed the radiological control limits for the sites and the soil was left in place.
Vegetation	Samples of perennial vegetation were collected near Hanford Site facilities and operations in 2006 and analyzed for radiological contaminants. Plant populations, including rare plants, were surveyed and monitored to assess the abundance, vigor or condition, and distribution of populations and species.	Concentrations of radionuclides were elevated in vegetation samples collected near facilities and operations when compared to concentrations in samples from distant communities collected in 2004.

All radiological contaminant concentrations measured in Columbia River water at the fixed sampling locations during 2006 were less than 1/25th of the DOE effective dose equivalent standard of 100 millirem per year. Tritium, strontium-90, uranium-234, and uranium-238 were consistently measured in transect and near-shore samples but all measured concentrations were less than applicable Washington State ambient surface-water quality criteria. Metals and anions were detected in Columbia River transect water samples both upstream and downstream of the Hanford Site. All concentrations measured in 2006 were below regulatory limits.

Sediment from the Columbia River. During 2006, samples of the surface layer of Columbia River sediment were collected from six locations that were permanently submerged. Samples were collected from the Priest Rapids Dam reservoir and from the McNary Dam reservoir. Samples were also obtained from slack water areas along the Hanford Reach and at the city of Richland. Radionuclides consistently detected at low levels in Columbia River sediment in 2006 included potassium-40, cesium-137, uranium-234, uranium-235, uranium-238, plutonium-238, and plutonium-239/240. In addition, europium-152 was detected at one Hanford Reach location. Detectable amounts of most metals were found in all river sediment samples. There are no Washington State freshwater sediment quality criteria for comparison to the measured metals values.

Water and Sediment from Ponds. Two onsite ponds, West Lake and the Fast Flux Test Facility pond, were sampled in 2006. Samples were obtained quarterly and included water from both ponds and sediment from West Lake. All water samples were analyzed for tritium and samples from the Fast Flux Test Facility pond were also analyzed for gross alpha, gross beta, and gamma-emitting radionuclides. All radionuclide concentrations in onsite pond water samples were less than applicable DOE-derived concentration guides. Concentrations in West Lake sediment samples were similar to concentrations measured in prior years.

Offsite Irrigation Water. In 2006, samples were collected from an irrigation water canal in the Riverview area of Pasco and from an irrigation water supply in Benton County near the southern boundary of the Hanford Site. All radionuclide concentrations were at the same levels detected in Columbia River water obtained upstream of the Hanford Site.



Water samples are routinely collected from the Hanford Reach of the Columbia River and analyzed for radionuclides and chemicals.

COLUMBIA RIVER SHORELINE SPRINGS MONITORING

Samples of Columbia River shoreline spring water and sediment were collected along the Hanford Reach and analyzed for Hanford-associated radiological and chemical contaminants that are present in groundwater beneath the Hanford Site.

Water from Columbia River Shoreline Springs. Grab samples of spring water were obtained from numerous locations in the fall when Columbia

River flows were low. Most samples were analyzed for gamma-emitting radionuclides, gross alpha, gross beta, and tritium. Samples from selected shoreline springs were analyzed for strontium-90, technetium-99, uranium-234, uranium-235, and uranium-238. Most samples were also analyzed for metals and anions. Samples from some locations were monitored for volatile organic compounds. All radiological contaminants measured in shoreline springs during 2006 were less than the applicable DOE concentration guides.



Routine monitoring of shoreline springs helps to characterize the quality of groundwater discharging to the Columbia River and to assess the potential human and ecological risk associated with the spring water.

For most locations in 2006, concentrations of volatile organic compounds were near or below their detection limits in all samples. Trace amounts of

chlorinated organic compounds were observed at some locations. The concentrations of most metals measured in spring water samples in 2006 were below Washington State ambient surface-water chronic toxicity levels. However, the maximum concentrations of dissolved chromium in water at some locations were above the Washington State ambient surface water chronic and acute toxicity levels.

Sediment from Columbia River Shoreline Springs. Shoreline springs sediment samples were collected in the 100-B, 100-F, and 100-H Areas, the 300 Area, and at the Hanford town site. Radionuclide concentrations were similar to concentrations measured in Columbia River sediment, with the exception of uranium concentrations in the 300 Area, which were above the concentration measured in sediment from the reservoir behind Priest Rapids Dam, upriver from the Hanford Site. Metals concentrations in all samples were also similar to concentrations measured in Columbia River sediment samples.

RADIOLOGICAL MONITORING OF HANFORD SITE DRINKING WATER

Samples of treated drinking water were collected monthly at facilities in the 100-K, 100-N, 200-West, and 400 Areas. Water used in the 400 Area is pumped from wells. Water treated at the other locations is obtained from the Columbia River. Water samples were analyzed for gross alpha, gross beta, tritium, strontium-90, iodine-131, radium-226, and radium-228. During 2006, annual average concentrations of all monitored radionuclides in Hanford Site drinking water were below state and federal maximum allowable contaminant levels.

GROUNDWATER MONITORING

At the Hanford Site, liquid waste released to the ground during many years of nuclear materials production has reached groundwater. Hazardous chemicals in the groundwater include carbon tetrachloride, chromium, and nitrate. Radioactive contaminants include iodine-129, strontium-90, technetium-99, tritium, and uranium. Currently, groundwater contaminant levels are greater than drinking water standards beneath 12% (71.8 square miles) of the area of the Hanford Site. This is down from 17.5% just a few years ago. The decrease is largely from radioactive decay of some contaminants and contaminant dispersion. Site groundwater does not significantly affect offsite drinking water sources, such as the Columbia River and city wells. However, where Hanford Site groundwater flows into the Columbia River, there are possible near-shore effects.



Groundwater is monitored at numerous locations along the Hanford Reach of the Columbia River.

FOOD AND FARM PRODUCTS MONITORING

During 2006, food and farm products including asparagus, apples, leafy vegetables, milk, potatoes, tomatoes, and wines were collected at places around the Hanford Site and analyzed for radiological contaminants. The concentrations of most radionuclides in food and farm product samples in 2006 were below levels that could be detected by the analytical laboratories. However, tritium and uranium-234 were detected at low levels in some samples, as was naturally occurring potassium-40.



Apples grown near the Hanford Site are routinely monitored for contaminants potentially from the Hanford Site.

SOIL MONITORING

In 2006, soil samples were collected at the Hanford Site near facilities and operations to evaluate long-term trends in the environmental accumulation of radioactive materials, to detect the potential migration of contaminants, and to monitor the deposition of facility emissions. Samples were analyzed for radionuclides expected to occur in the areas sampled. In general, radionuclide concentrations in soil samples collected from or adjacent to waste-disposal facilities in 2006 were higher than the concentrations in samples collected farther away, and were higher than concentrations measured offsite in previous years. The data also showed that concentrations of certain radionuclides in 2006 were higher within different operational areas when compared to concentrations measured in distant communities in previous years. Generally, the predominant radionuclides detected were activation and fission products in the 100-N Area, fission products in the 200 and 600 Areas, and uranium in the 300 and 400 Areas.

VEGETATION MONITORING

This section includes discussions on surveys and monitoring of Hanford Site plant populations, monitoring contaminants in perennial vegetation growing near facilities and work areas on the site, and control of contaminated or unwanted vegetation on the site.



Phlox is a spring-blooming wildflower on portions of the Hanford Site.

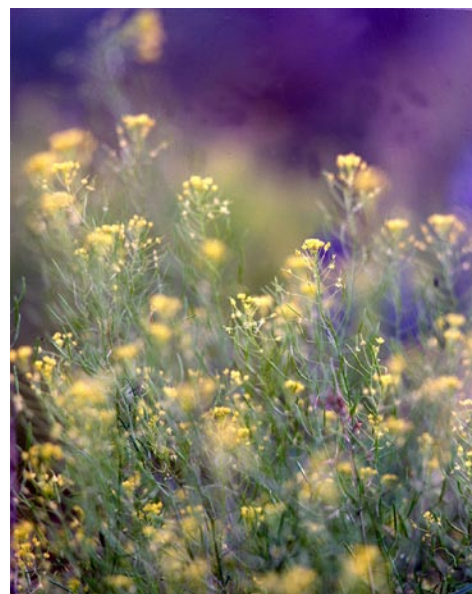
Plant Communities and Population Surveys. Plant populations monitored on the Hanford Site include species listed by Washington State as endangered, threatened, or sensitive, and species listed as review group 1. Monitoring data are used to develop baseline information and to monitor for changes resulting from Hanford Site operations. During 2006, work focused on developing a computer model to map shrub canopy cover using field-measured shrub canopy cover and texture data derived from aerial imagery, surveys for rare annual species within specific areas inside specific habitat types, and monitoring established transects to examine the condition and status of persistent sepal yellowcress along the Columbia River shoreline near the 100-F Area and on three Hanford Reach islands.

Vegetation Monitoring Near Hanford Site Facilities and Operations. Vegetation samples were collected on or adjacent to former waste-disposal sites, and from locations downwind and near or within the boundaries of operating facilities and remedial action sites to monitor for radioactive contaminants. In general, radionuclide concentrations in vegetation samples

collected from, or adjacent to, waste-disposal facilities in 2006 were higher than concentrations in samples collected farther away and were significantly higher than concentrations measured offsite in prior years. The data also show that concentrations of certain radionuclides in 2006 were higher within different onsite operational areas when compared to concentrations measured in distant communities in previous years. Generally, the predominant radionuclides detected were activation and fission products in the 100-N Area, fission products in the 200 and 600 Areas, and uranium in the 300 and 400 Areas.

Investigations of Radioactivity in Vegetation Near Hanford Site Facilities and Operations. During 2006, radiological contamination was found in 75 vegetation samples collected around areas of known or suspected contamination or around specific project sites. Seventy-four of the samples were tumbleweed fragments and one was listed as moss. All were field surveyed for gross alpha and gross beta, but none were analyzed for specific radionuclides. All were disposed of in onsite burial grounds.

Vegetation Control Activities. Vegetation control at the Hanford Site consists of cleaning up contaminated plants that can be a threat to workers or the public, controlling or preventing the growth or re-growth of plants in contaminated or potentially contaminated areas on the site, and monitoring and removing 10 high-priority noxious plant species.



Tansey mustard is a native plant that is widespread on the Hanford Site.

FISH AND WILDLIFE MONITORING

Fish and wildlife monitoring on the Hanford Site includes conducting surveys of and monitoring Hanford Site animal populations, monitoring fish and wildlife tissues for contaminants from the site, and managing wildlife that might affect workers or have become radiologically contaminated.

Wildlife Populations Surveys. Four fish and wildlife species on the Hanford Site are surveyed annually: fall Chinook salmon, steelhead, bald eagles, and mule deer. The number of fall Chinook salmon spawning nests (redds) in the Hanford Reach is estimated by aerial surveys. The peak redd count in the fall of 2006 was estimated at 6,190, below the 5-year average for 2001–2005 of 8,023. One aerial survey was conducted to identify possible steelhead spawning areas; none were found.



Geese occupy fields near the 300 Area during the fall.

Surveys were conducted in early 2007 to evaluate the current distribution of bald eagle night roosts and assess the rates of roost use along the Hanford Reach shoreline from the Vernita Bridge to the 300 Area. Thirty-six bald eagles were observed using roosts; however, this total may include multiple observations of one or more birds.

Roadside surveys were conducted for mule deer on the Hanford Site to assess age and sex ratios and the frequency of testicular atrophy in males. Testicular atrophy has been associated with an unusually large number of older deer residing on the Hanford Site.



Fishing is a popular activity on the Hanford Reach of the Columbia River.

Monitoring Fish and Wildlife for Hanford-Produced Contaminants.

In 2006, mule deer, California quail, common carp, and suckers were collected at locations on and around the Hanford Site. Tissue samples were analyzed for strontium-90 and gamma emitters, including cesium-137. Since the 1990s, strontium-90 and cesium-137 have been the most frequently measured radionuclides in fish and wildlife samples. Cesium-137 was not detected in any sample in 2006. Strontium-90 was detected at low levels in all deer samples collected onsite, in 1 of 6 onsite quail samples, and in 8 of 10 Hanford Reach fish samples. Liver tissues from most organisms were monitored for up to 17 trace metals. For most trace metals, concentrations in samples collected on the Hanford Site or in the Hanford Reach

in 2006 were approximately the same as concentrations in samples collected at reference locations.

Control of Pests and Contaminated Biota. Animals (including insects) must be controlled when they become a nuisance, potential health problem, or are contaminated with radioactivity. Biological control personnel responded to approximately 28,000 animal control requests from Hanford Site employees in 2006. There were 21 contaminated animals or animal-related materials discovered in 2006.

EXTERNAL RADIATION MONITORING

In 2006, external radiation at the Hanford Site was monitored onsite in relative close proximity to known, suspected, or potential radiation sources. A thermoluminescent dosimeter system is used to measure external radiation at

the Hanford Site. Additionally, radiation surveys with portable instruments were conducted at some locations to monitor and detect contamination and to provide a screening for external radiation fields.

Thermoluminescent Dosimeters. During the year, external radiation levels can vary from 15% to 25% at any location because of changes in soil moisture and snow cover. At most locations in 2006, measured radiation levels were similar to or lower than levels measured in 2005. During part of the year, radiation levels at one location in the 100-K Area increased when sludge was being transferred out of the K Basins. Readings around the 200-North Area in 2006 were also elevated relative to most other locations on the site but were lower than levels measured in 2005.

Radiation Surveys. In 2006, 515 radiation surveys were conducted at and around active and inactive waste-disposal sites. It was estimated that the external dose rate at 80% of the outdoor contamination areas was less than 1 millirem per hour, though direct dose rate readings from isolated radioactive specks could have been higher. In 2006, the Hanford Site had approximately 8,853 acres of outdoor contaminated areas of all types and approximately 1,483 acres that contained underground radioactive materials, not including active facilities.



Thermoluminescent dosimeters are used to measure external radiation at the Hanford Site.

POTENTIAL RADIOLOGICAL DOSES FROM 2006 HANFORD SITE OPERATIONS

During 2006, potential radiological doses to the public and biota from Hanford Site operations were evaluated to determine compliance with pertinent regulations and limits. Doses were assessed in terms of 1) total dose (multiple pathways) to the hypothetical, maximally exposed individual at an offsite location; 2) average dose to the collective population living within 50 miles of Hanford Site operating areas; 3) dose for air pathways using EPA methods; 4) dose to workers on the site consuming drinking water; 5) inhalation doses associated with measured radionuclide concentrations in air; 6) doses from non-DOE industrial sources on



Thermoluminescent dosimeters are collected and processed quarterly.

All doses from Hanford Site activities in 2006 were much lower than EPA and DOE allowable limits.



Lightning strikes at the Hanford Site occasionally start wildfires.

Meteorological measurements are taken to support Hanford Site emergency preparedness and response, site operations, and atmospheric dispersion calculations for dose assessments.

and near the Hanford Site; and 7) absorbed dose received by animals exposed to contaminants released to the Columbia River and in onsite surface water bodies. All doses from Hanford Site activities in 2006 were much lower than EPA and DOE standards.

CLIMATE AND METEOROLOGY

Meteorological measurements support Hanford Site emergency preparedness, site operations, and atmospheric dispersion calculations. Activities include weather forecasting and maintaining and distributing climatological data.

The calendar year 2006 average temperature was slightly above normal and precipitation was above normal. The average temperature for 2006 was 54.1°F, which was 0.5°F above normal (53.6°F). Five months during 2006 were warmer than normal; seven months were cooler than normal. January had the greatest positive departure, 6.6°F above normal; December, at 2.7°F below normal, had the greatest negative departure.

Precipitation during 2006 totaled 8.46 inches, which is 121% of normal (6.98 inches). Snowfall for 2006 totaled 4.4 inches, compared to normal snowfall of 15.4 inches.

The average wind speed during 2006 was 7.8 miles per hour, which was 0.2 mile per hour above normal. The peak gust for the year was 74 miles per hour on December 15.

One dust storm was recorded at the Hanford Meteorology Station during 2006. There has been an average of five dust storms per year at the Hanford Meteorology Station during the entire period of record (1945-2006).

CULTURAL AND HISTORIC RESOURCES

The DOE is responsible for managing and protecting the Hanford Site's cultural and historic resources. The Hanford Cultural and Historic Resources

Program assists the DOE in managing cultural and historic resources responsibly and in accordance with applicable regulatory requirements.

Cultural resources reviews are required before a federally funded, federally assisted, or federally licensed ground disturbance or building alteration/demolition project can take place. As such, cultural resource reviews identify properties within the proposed project area that may be eligible for, or listed in, the National Register of Historic Places, and evaluate the project's potential to affect any such property. During 2006, Hanford Site contractors requested 166 cultural resource reviews.

The Hanford Site has a program to assess the effects of weathering and erosion, or unauthorized excavation and collection, upon the site's cultural resources. Activities include onsite inspections of important sites. In 2006, 17 sites were visited and minor impacts from recreation, natural erosion, and animal activity were recorded.



Cultural resources personnel measuring the walls in the Snively Homestead "Spring" House located on the Fitzner/Eberhardt Arid Lands Ecology Reserve Unit of the Hanford Reach National Monument.

QUALITY ASSURANCE

Comprehensive quality assurance programs, which include various quality control practices and methods to verify data, are maintained by monitoring and surveillance projects to assure 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.

Samples are collected and analyzed according to documented standard procedures. Analytical data quality was verified by a continuing program of internal laboratory quality control, participation in interlaboratory crosschecks, replicate sampling and analysis, submittal of blind standard samples and blanks, and splitting samples with other laboratories.

REPORT INQUIRIES

Inquiries about this booklet or comments and suggestions about its content may be directed to Mr. D.C. (Dana) Ward, U.S. Department of Energy, Richland Operations Office, P.O. Box 550, Richland, Washington 99352 (Dana_C_Ward@rl.gov), or to Mr. R.W. (Bill) Hanf, K6-75, Pacific Northwest National Laboratory, P.O. Box 999, Richland, Washington 99352 (bill.hanf@pnl.gov).

Copies of this summary booklet and the 2006 report have been provided to many public libraries in communities around the Hanford Site and to several university libraries in Washington and Oregon. Copies also can be found at the DOE's Public Reading Room located in the Consolidated Information Center, Room 101L, in Richland, Washington. Copies of the 2006 report can be obtained from Mr. R.W. (Bill) Hanf, K6-75, Pacific Northwest National Laboratory, P.O. Box 999, Richland, Washington 99352 (bill.hanf@pnl.gov) while supplies last. The reports can also be accessed on the Internet at <http://hanford-site.pnl.gov/envreport>.