

# 1.0 Introduction

The U.S. Department of Energy (DOE) monitors groundwater at the Hanford Site to fulfill a variety of state and federal regulations, including the *Atomic Energy Act of 1954*, the *Resource Conservation and Recovery Act of 1976 (RCRA)*, the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)*, and Washington Administrative Code. DOE manages these activities through the Hanford Groundwater Monitoring Project, which is conducted by Pacific Northwest National Laboratory.

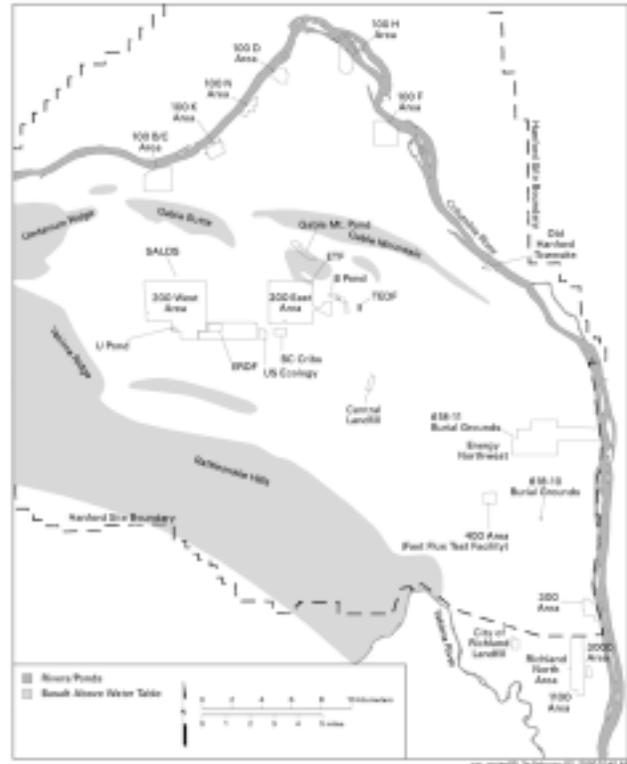
## 1.1 Purpose and Scope

**M. J. Hartman**

*Hanford Site Groundwater Monitoring for Fiscal Year 1999* presents results of monitoring. These results primarily rely on data from samples collected between October 1, 1998, and September 30, 1999. Data received from the laboratory after November 8, 1999, may not have been considered in the interpretations.

This report is designed to meet the following objectives:

- provide a comprehensive report of groundwater conditions on the Hanford Site and adjacent areas
- fulfill the reporting requirements of RCRA, DOE orders, and Washington Administrative Code
- summarize the results of groundwater monitoring conducted to assess the effects of remediation or interim measures conducted under CERCLA
- describe the results of vadose zone monitoring and characterization
- summarize groundwater modeling activities
- summarize the installation, maintenance, and decommissioning of Hanford Site monitoring wells.



Environmental restoration work, which includes groundwater remediation and associated monitoring of pumping wells, is the responsibility of Bechtel Hanford, Inc. Vadose zone monitoring and characterization are conducted by Fluor Hanford, Inc., Bechtel Hanford, Inc., and Pacific Northwest National Laboratory.

This year's report has been reorganized to make it easier to use. Annual reports for fiscal years 1996, 1997, and 1998 contained descriptions of regulatory requirements, waste sites, analytical methods, regional geology, and statistics. This background information was important but repetitive, and readers found that it impeded their ability to find the substance of the report. This year that background information was published

in a separate report, *Hanford Site Groundwater: Setting, Sources and Methods* (PNNL-13080). That document will not be updated every year and will be available as a reference companion to the annual reports such as this one.

The discussions of groundwater flow and groundwater chemistry are combined in this year's report. Supporting information in the appendices has also been consolidated this year. Compliance issues, statistical evaluations, monitoring networks, and maps for regulated units are included in Appendix A.

Finally, the physical layout of the report has been redesigned to include more white space, inset sketch maps to orient the reader, and textboxes to emphasize key points.

Please note two changes in the way data are displayed in figures. Maps in this year's report show data from fiscal years 1997 and 1998 if there were no new data for a well in fiscal year 1999. Wells that monitor plumes that change slowly are sampled every 3 years, so this change allows us to see the most recent data. Trend plots in this year's report use open symbols to show data that were reported below laboratory detection limits.

As in previous reports, the enclosed computer diskette contains groundwater data for the fiscal year. Large plate maps show the wells used for monitoring, the Hanford Site water table, and the distribution of tritium (the most widespread contaminant) in the uppermost aquifer.

This report, PNNL-13080, and the fiscal year 1998 report are available on the internet through the groundwater project's web site: <http://hanford.pnl.gov/groundwater>.

## 1.2 Related Reports

### M. J. Hartman

Other reports and databases relating to Hanford Site groundwater in fiscal year 1999 include the following:

- *Hanford Site Environmental Report for Calendar Year 1998* (PNNL-12088) — This annual report summarizes environmental data, describes environmental management performance, and reports the status of compliance with environmental regulations. Topics include effluent monitoring, surface water and sediment surveillance, soil and vegetation sampling, vadose and groundwater monitoring, radiological surveys, air surveillance, and fish and wildlife surveillance.
- Hanford Environmental Information System (HEIS) — This is the main environmental database for the Hanford Site that stores groundwater chemistry and water-level data, as well as other environmental data (e.g., soil chemistry, survey data).

### Conversion Table

The primary units of measurement in this report are metric. To convert metric units to English units, use the information provided in this table.

Multiply	By	To Obtain
centimeters	0.394	inches
meters	3.28	feet
kilometers	0.621	miles
kilograms	2.205	pounds
liters	0.2642	gallons
square meters	10.76	square feet
hectares	2.47	acres
square kilometers	0.386	square miles
cubic meters	1.308	cubic yards
picocuries	1,000	nanocuries
curie	$3.7 \times 10^{10}$	becquerel
picocurie	0.03704	becquerel
rem	0.01	sievert
°Celsius	$(^{\circ}\text{C} \times 9/5) + 32$	°Fahrenheit

- Quarterly data transmittals — DOE transmits letters quarterly to the Washington State Department of Ecology after groundwater data collected for the RCRA program have been verified and evaluated. These letters describe changes or highlights of the quarter with reference to HEIS for the analytical results.
- *Fiscal Year 1999 Annual Summary Report for the 200-UP-1, 200-ZP-1, and 100-NR-2 Pump-and-Treat Operations and Operable Units* (DOE/RL-99-79) — This report describes results of remediation and monitoring in three groundwater operable units.
- Annual report for 100-KR-4 and 100-HR-3 interim remedial action (in preparation) — This report describes results of remediation and monitoring in two groundwater operable units, including 100 K, 100 D, and 100 H areas.

### 1.3 Groundwater/Vadose Zone Integration Project

#### *T. M. Wintczak*

DOE established the groundwater/vadose zone integration project (integration project) in late 1997 to provide a new approach for protecting the Columbia River. DOE directed the integration project to be science-based, to include strong participation from DOE's national laboratories, to incorporate rigorous technical reviews, and to engage diverse stakeholders in project decisions in a meaningful way. The Hanford Groundwater Monitoring Project is under the umbrella of the integration project.

In March 1998, the General Accounting Office issued the report *Understanding of Waste Migration at*

*Hanford is Inadequate for Key Decisions* (GAO/RCED-98-80). The report concluded that the DOE's understanding of how waste moves through the vadose zone to groundwater was inadequate for making key technical decisions on how to clean up the Hanford Site in an environmentally sound and cost-effective manner. The report also highlighted DOE's inability to credibly estimate the Hanford Site's long-term risk to the public, and underscored the need to investigate vadose zone conditions. DOE and the integration project have made significant progress in meeting the challenges described in the report.

Another significant focus of the integration project involves the preparation of a cumulative impact assessment of the Hanford Site radioactive and hazardous contaminants that have affected, or may affect, use of the Columbia River. The Columbia River Comprehensive Impact Assessment (CRCIA) Part II report (DOE/RL-96-16, Rev. 1) established the basis for this type of holistic assessment. The Systems Assessment Capability will support cleanup decisions and actions, such as the eventual completion of a final record of decision for the cleanup of the overall Hanford Site.

Ultimately, the integration project must work to ensure the protection of all the Hanford Site's water resources (i.e., vadose zone/soils and groundwater) and all the users of the Columbia River. To be successful, the integration project must

- adopt a site-wide approach to planning and funding
- ensure that management attention is maintained on the subsurface and river resources
- be recognized for technical and scientific excellence in all products
- establish and ensure effective two-way communications with diverse project participants.