4.3 Hanford Site Drinking Water Surveillance

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The primary purpose of the Hanford Site drinking water surveillance program is to verify the quality of the drinking water supplied by Site drinking water systems. This is achieved by routinely collecting and analyzing drinking water samples and comparing the data with established drinking water standards and guidelines (Appendix C, Tables C.2 and C.5). In 1995, radiological surveillance of drinking water on the Site was conducted for ICF Kaiser Hanford primarily by Pacific Northwest National Laboratory. However, Westinghouse Hanford Company collected radiological data for one system as noted below. Chemical and microbiological surveillance was conducted by ICF Kaiser Hanford. In previous years, nonradiological sampling of Hanford Site drinking water was done by the Hanford Environmental Health Foundation. Their data were combined with radiological data supplied by other Site contractors and published by the Hanford Environmental Health Foundation in an annual Hanford sanitary water quality surveillance report (Thurman 1994, 1995). ICF Kaiser Hanford is not producing a 1995 drinking water report due in part to recent reductions in federal funding. Therefore, the 1995 radiological data for Hanford Site drinking water are summarized here, and the individual results are reported in *1995 Hanford Environmental Surveillance Data* (Bisping 1996). Nonradiological data will not be published at this time. Washington Administrative Code (WAC) 246-290, "Drinking Water Regulations," requires that all drinking water analytical results be reported to the state of Washington. Nonradiological results have been reported to the state by ICF Kaiser Hanford throughout the year; radiological results are provided to the state and to Site contractors in this report and by Bisping (1996).

Radiological Monitoring of Hanford Site Drinking Water Systems

Drinking water is supplied to the Site through a system of contractor operated water systems. Most of these systems use water from the Columbia River and consist of pumping stations and/or treatment and distribution facilities. A few systems use ground water from beneath the Site. Most of the systems are operated by ICF Kaiser Hanford. Westinghouse Hanford Company and Bechtel Hanford Inc. also each operate two and one system, respectively, although water for the Bechtel system is supplied by a pumping station operated by ICF Kaiser Hanford (Table 4.3.1). The City of Richland provides drinking water to the 300 (backup water supply), 700, 1100, 3000, and Richland North Areas of the Site; however, this water is not monitored through the Site drinking water surveillance program and is not discussed in this report. Pacific Northwest National Laboratory does collect water samples from the Columbia River at the Richland Pumphouse, which is the City of Richland's drinking water intake, and the analytical results for the river water samples are discussed in Section 4.2, "Surface Water and Sediment Surveillance."

Hanford Site drinking water systems are identified in Table 4.3.1. Ten of the systems used Columbia River water, and three used ground water. Sampling was discontinued at Pacific Northwest National Laboratory's observatory on Rattlesnake Mountain in late 1994 because the facility's water supply was no longer in use. The building is now supplied with bottled water on an as-needed basis.

In 1995, radionuclide concentrations were monitored at the locations shown in Figure 4.3.1, which represent the primary sources of water for the Site drinking water systems. The 100-B pumphouse continued to serve as the primary Columbia River pumping station for many areas on the Site (the 100-N, 200-East, and 200-West Areas, the 251 Building, and the 100 Area Fire Station), with the 100-D pumphouse available as an emergency backup. Water for the 100-K Area was supplied by the 100-K pumphouse. The Yakima Barricade, Patrol Training Academy, and the 400 Area obtained water from ground-water wells. As in past years, drinking water in buildings on the Fitzner/Eberhardt Arid Lands Ecology Reserve was supplied by bottled water in 1995 because

Table 4.3.1. Hanford Drinking Water Systems[a]

System Name/ ID Number	Source of Supply	Notes
100-D/001761	Columbia River via 181-B or D Raw Water Export	Filtered and chlorinated at 183-D. System is operated by ICF Kaiser Hanford.
100-B/04480U	Columbia River via 181-B or D Raw Water Export	Filtered and chlorinated at 182-B.
100-K/00177	Columbia River via 181-K Pump House	Filtered and chlorinated at 183-K. System is operated by Westinghouse Hanford Company.
100-N/418532	Columbia River via 181-B or D Raw Water Export	Filtered and chlorinated at 183-N. System is operated by Bechtel Hanford Inc.
200-E/41866V	Columbia River via 181-B or D Raw Water Export	Filtered and chlorinated at 283-E. System is operated by ICF Kaiser Hanford.
200-W/001004	Columbia River via 181-B or D Raw Water Export	Filtered and chlorinated at 283-W. System is operated by ICF Kaiser Hanford.
251 Bldg/001782 (Electrical Switching)	Columbia River via 181-B or D Raw Water Export	Filtered and chlorinated at 251 Building. System is operated by ICF Kaiser Hanford.
609 Bldg/001806 (100-Area Fire Station)	Columbia River via 181-B or D Raw Water Export	Filtered and chlorinated at 609 Building. System is operated by ICF Kaiser Hanford.
Yakima Barricade/ 001848	Well 699-49-100C	No treatment provided. System is operated by ICF Kaiser Hanford.
6652-C/001827 (PNNL Observatory)	Developed spring on side of Rattlesnake Mountain (Elev. 3,160 ft)	Chlorination only. System is operated by Pacific Northwest National Laboratory and maintained by ICF Kaiser Hanford. (Removed from service in 1994.)
Patrol Training Academy/00183Q	Well 699-S28-E0	Chlorination only. System is operated by ICF Kaiser Hanford.
400 Area/419470	Wells 499-S1-8J, 499-S0-7, and 499-S0-8	Supplied from 499-S1-8J (P-16); 499-S0-7 (P-15) is the emergency supply, 499-S0-8 (P-14) is the dire emergency supply. Chlorination only. System is operated by Westinghouse Hanford Company.
300 Area/418408	Columbia River via 312 Pump House or City of Richland	Filtered and chlorinated at 315 Building. System is operated by ICF Kaiser Hanford.

(a) Adapted from Thurman (1995).

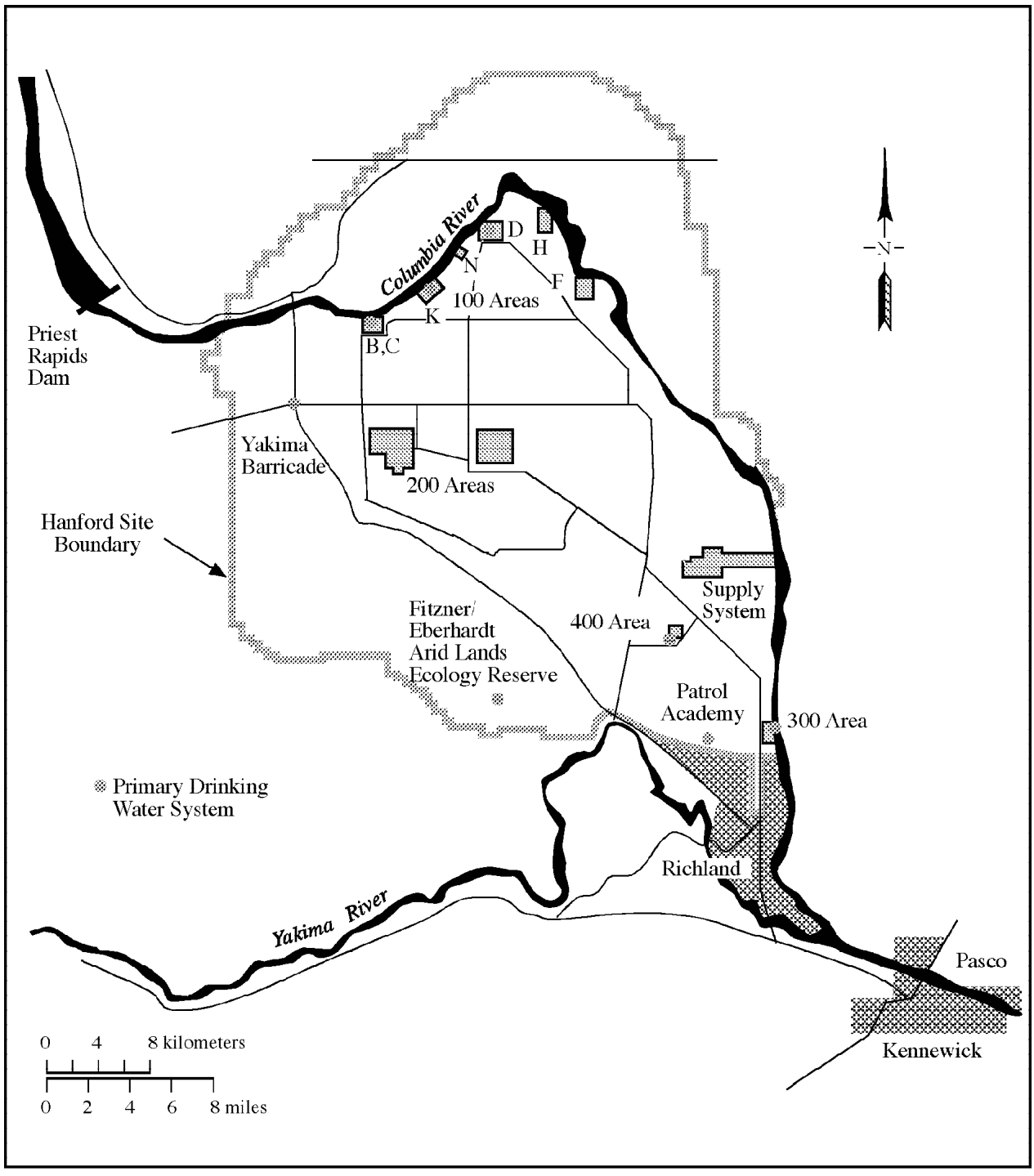


Figure 4.3.1. Hanford Site Primary Drinking Water Systems

of naturally occurring elevated fluoride levels in the water supply well. However, radiological monitoring of the facility's well continued in 1995. The 400 Area continued to use well 499-S1-8J (P-16) for drinking water, with well 499-SO-7 (P-15) serving as the emergency supply. Well 499-SO-8, used in past years as the primary 400 Area drinking water supply, now functions as the emergency supply well. Water from well 499-SO-8 (P-14) was not used in 1995.

Collection and Analysis of Drinking Water Samples

Samples for radiological analysis were collected according to a schedule established at the beginning of the calendar year (Bisping 1995a). The majority of the samples were collected and analyzed quarterly. The 300 Area samples were collected monthly and composited for quarterly analysis. At the 400 Area, samples were collected monthly for tritium analysis, annually for iodine-129 analysis, or quarterly for other analyses. Samples from most locations were grab samples of treated water collected at the tap (Table 4.3.1). The 300 Area samples were cumulative raw river water samples that were collected at the water supply pumphouse before any water treatment (see Section 4.2, "Surface Water and Sediment Surveillance"). Tap water samples collected from the 400 and 100-D Areas during the second quarter of the year were collected in conjunction with the Washington State Department of Health. These duplicate samples were analyzed in different laboratories to provide a check on data quality. Results for the state samples will be available in the Washington State Department of Health Environmental Radiation Program annual report for 1995.

Radiological analyses of 1995 drinking water samples included total alpha, total beta, gamma scan, tritium or low level tritium, and strontium-90. Samples from the 400 Area were also analyzed for iodine-129. River samples from the 300 Area and the Richland Pumphouse were analyzed for technetium-99 and uranium. Radionuclides of interest were selected based on monitoring requirements, their presence in the source water, and their importance in determining compliance with applicable standards. Alpha and beta measurements provided a general indication of the radioactive contamination. Gamma scans provided the ability to detect numerous specific radionuclides (see Appendix E). Sensitive radiochemical analyses were used to determine the concentrations of iodine-129, technetium-99, tritium, and uranium.

Radiological Results for Hanford Site Drinking Water

The Hanford Site was in compliance with Washington State Department of Health and EPA annual average radiological drinking water standards in 1995, and results were similar to those observed in recent years (Thurman 1994, 1995). Results of radiological monitoring of Hanford Site drinking water during 1995 are summarized in Table 4.3.2. Concentrations of total alpha, total beta, tritium, and strontium-90 are included in the table to demonstrate compliance with drinking water standards. The maximum amount of beta-gamma radiation from manmade radionuclides allowed in drinking water by the Washington State Department of Health and U.S. EPA is an annual average concentration that will not produce an annual dose equivalent to the whole body or any internal organ greater than 4 millirem per year. If more than one radionuclide is present, the sum of their annual dose equivalents must not exceed 4 millirem. Compliance with this standard may be assumed if the annual average concentrations of total beta, total alpha, tritium, and strontium-90 are less than 50 pCi/L, 15 pCi/L, 20,000 pCi/L, and 8 pCi/L, respectively (see Appendix C, Table C.2).

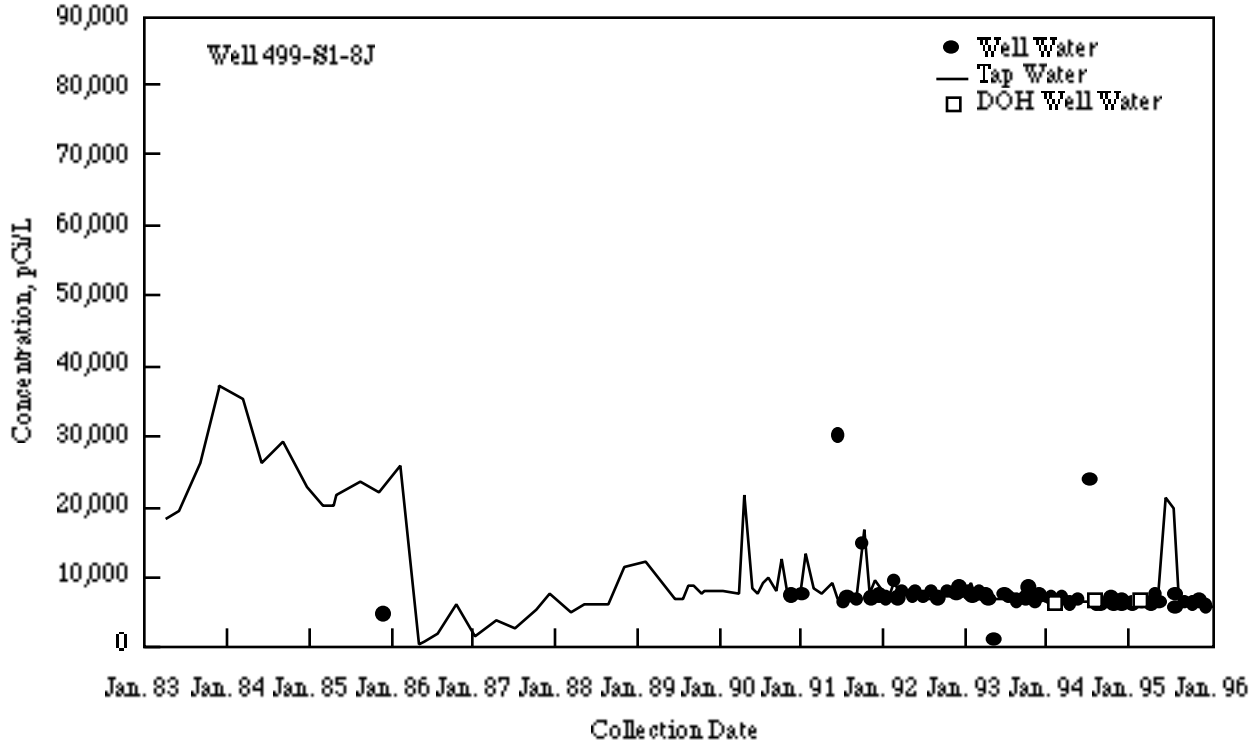
The annual average tritium concentration in 400 Area drinking water in 1995 (8,424 ± 304 pCi/L) was in compliance with the EPA annual average tritium standard of 20,000 pCi/L. However, tritium concentrations in monthly drinking water samples collected from the 400 Area in June and July were above 20,000 pCi/L (21,100 ± 1,640 pCi/L and 20,300 ± 1,580 pCi/L, respectively). The elevated tritium levels occurred when the principal drinking water supply well for the 400 Area (499-S1-8J) was shut down and water from the emergency well (499-SO-7), which draws water from a more contaminated portion of the aquifer, was substituted. The primary back-up well is used as a drinking water source when the principal well is inoperable. Figure 4.3.2 illustrates the tritium concentrations in the 400 Area drinking water supply wells used in 1995 for the period 1983 through 1995. Data were collected by Pacific Northwest National Laboratory's Ground-Water and Surface Environmental Surveillance Projects, and the Washington State Department of Health. The radiological doses associated with drinking this water are discussed in Section 5.0, "Potential Radiation Doses from 1995 Hanford Operations."

Iodine-129 was measured in one sample of 400 Area drinking water collected in August. The result (0.0095 ± 0.001 pCi/L) was well below the 1.0 pCi/L drinking water standard that would result in an annual dose equivalent of 4 millirem.

Table 4.3.2. Radiological Contaminants in Hanford Drinking Water Systems - 1995 Annual Average Concentrations,[a] pCi/L

System	No. of Samples	Total Alpha	Total Beta	^{3}H	^{90}Sr
100-B Area	4	0.41 ± 0.22	0.94 ± 1.98	45 ± 6[b]	0.64 ± 0.009
100-D Area	4	0.19 ± 0.19	0.24 ± 1.25	64 ± 16	0.08 ± 0.02
100-K Area[c]	4	0.115 ± 0.376	0.917 ± 2.71	61.5 ± 91.7	0.027 ± 0.142
300 Area	4	1.05 ± 0.30	1.95 ± 1.42	129 ± 52[b]	0.16 ± 0.17
Yakima Barricade	4	1.30 ± 0.71	7.92 ± 2.38	-18 ± 33	-0.10 ± 0.02
400 Area	4[d]	0.12 ± 0.44	6.72 ± 1.82	8,424 ± 304	0.004 ± 0.006
Patrol Academy	4	1.01 ± 0.72	4.29 ± 1.90	-2.83 ± 46	0.004 ± 0.01
Fitzner/Eberhardt Arid Lands Ecology Reserve	4	1.0 ± 0.86	9.76 ± 2.21	3.21 ± 40	-0.009 ± 0.02
Standards[e]	-	15	50	20,000	8

(a) Average value ±2 standard error of the calculated mean.
(b) Low-level tritium.
(c) Reported by Westinghouse Hanford Company.
(d) Thirteen ^{3}H samples.
(e) See Appendix C, Table C.2.



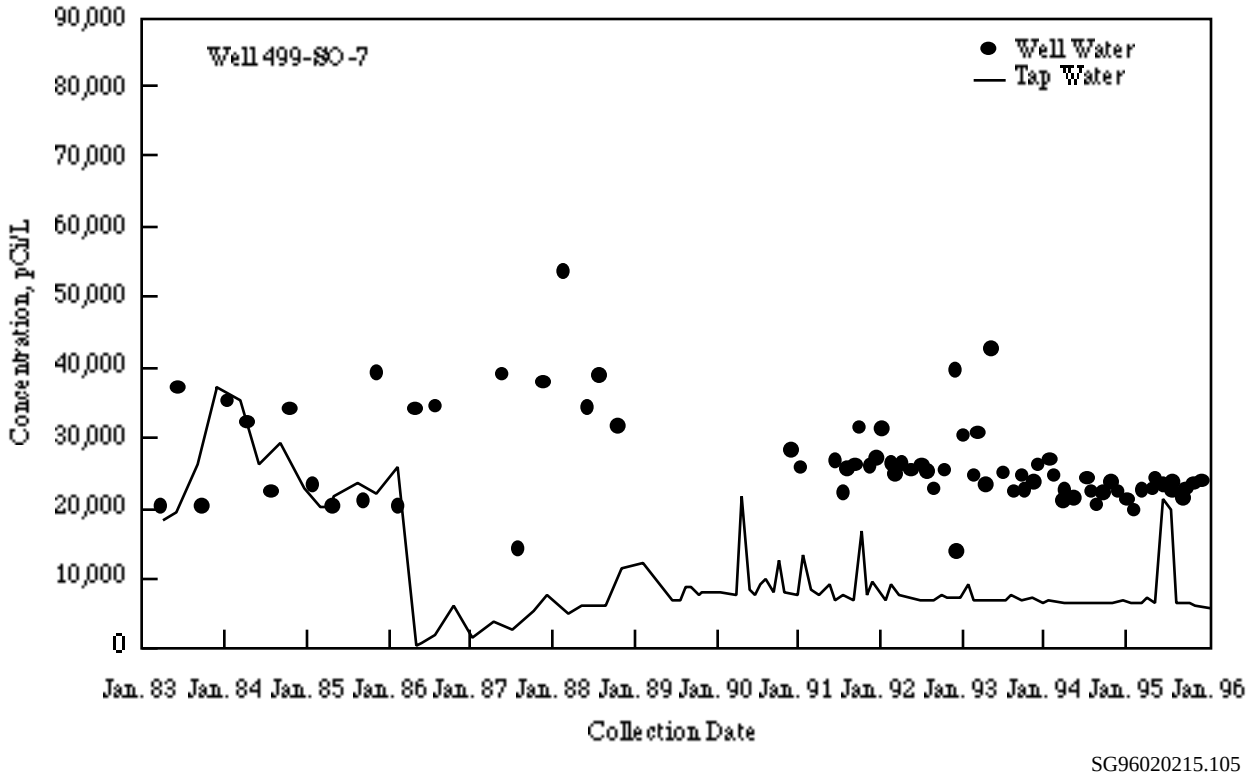


Figure 4.3.2. Tritium Concentrations in 400 Area Drinking Water