4.3 Hanford Site Drinking Water Surveillance

R. W. Hanf

The primary purpose of the Hanford Site drinking water surveillance program is to verify the quality of the site's drinking water. This is achieved by routinely collecting and analyzing drinking water samples and comparing the data with established drinking water standards and guidelines (WAC 246-290 and 40 CFR 141; see Appendix C, Tables C.2 and C.5). In 1996, radiological surveillance of drinking water on the site was conducted for DynCorp Tri-Cities Services, Inc. primarily by Pacific Northwest National Laboratory. However, Westinghouse Hanford Company (from January through September 1996) and DE&S Hanford, Inc. (from October through December 1996) each collected radiological data for one system as noted below. Chemical and microbiological surveillance was conducted by DynCorp Tri-Cities Services, Inc. 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 in an annual Hanford sanitary water quality surveillance report (Thurman 1994, 1995). DynCorp Tri-Cities Services, Inc. is not producing a 1996 drinking water surveillance report due in part to continuing reductions in federal funding. Therefore, the 1996 radiological data for Hanford Site drinking water are summarized here, and the individual results are reported in Bisping (1997). Nonradiological data will not be published at this time. WAC 246-290 requires that all drinking water analytical results be reported to the state of Washington. Nonradiological results have been reported to the state by DynCorp Tri-Cities Services, Inc. throughout the year; radiological results are provided to the state and to site contractors in this report and in Bisping (1997).

Radiological Monitoring of Hanford Site Drinking Water Systems

Drinking water is supplied to the site through contractor-operated water systems. Nine of these systems use water from the Columbia River and consist of pumping stations and/or treatment and distribution facilities. Three systems use groundwater from beneath the site (Table 4.3.1). Most of the systems are operated by DynCorp Tri-Cities Services, Inc. However, DE&S Hanford, Inc., Bechtel Hanford, Inc., and B&W Hanford Company also each operate one system, though water for the Bechtel system is supplied by a pumping station operated by DynCorp. The city of Richland provides drinking water to the 700, 1100, and Richland North Areas of the site and serves as a backup supplier for the 300 Area. This water, however, is not monitored through the site drinking water surveillance program and is not discussed here. 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 can be found in Appendix A (Table A.2).

In 1996, radionuclide concentrations were monitored at the locations shown in Figure 4.3.1, which represent the principal sources of water for the site drinking water systems. The 100-B Area 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 Areas Fire Station), with the 100-D Area pumphouse available as an emergency backup. Water for the 100-K Area was supplied by the 100-K Area pumphouse. The Yakima Barricade, Patrol Training Academy, and the 400 Area (Fast Flux Test Facility) obtained water from groundwater wells.

The 400 Area continued to use well 499-S1-8J (P-16) for drinking water, with well 499-S0-7 (P-15) serving as the emergency supply for most of the year. Well 499-S0-7 was used only once when well 499-S1-8J was shut down for maintenance from August 1 to 6, 1996.

A review of tritium data for all three 400 Area drinking water wells resulted in a reclassification of wells 499-S0-7 and 499-S0-8 late in 1996. Well 499-S0-7 was designated as the dire emergency well, and well 499-S0-8 became the emergency well. Tritium levels in well 499-S0-8

Table 4.3.1. Hanford Site Drinking Water Systems

System Name/ Number	Source of Supply	Notes
100-D/001761	Columbia River via 181-B or D Raw Water Export	Filtered and chlorinated at 183-D. Operated by DynCorp Tri-Cities Services, Inc.
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 Pumphouse	Filtered and chlorinated at 183-K. Operated by DE&S Hanford, Inc.
100-N/418532	Columbia River via 181-B or D Raw Water Export	Filtered and chlorinated at 183-N. Operated by Bechtel Hanford, Inc.
200-E/41866V	Columbia River via 181-B or D Raw Water Export	Filtered and chlorinated at 283-E. Operated by DynCorp Tri-Cities Services, Inc.
200-W/001004	Columbia River via 181-B or D Raw Water Export	Filtered and chlorinated at 283-W. Operated by DynCorp Tri-Cities Services, Inc.
251 Bldg/001782 (Electrical Switching)	Columbia River via 181-B or D Raw Water Export	Filtered and chlorinated at 251 Building. Operated by DynCorp Tri-Cities Services, Inc.
609 Bldg/001806 (100 Areas Fire Station)	Columbia River via 181-B or D Raw Water Export	Filtered and chlorinated at 609 Building. Operated by DynCorp Tri-Cities Services, Inc.
Yakima Barricade/ 001848	Well 699-49-100C	No treatment provided. Operated by DynCorp Tri-Cities Services, Inc.
Patrol Training Academy/00183Q	Well 699-S28-E0	Chlorination only. Operated by DynCorp Tri-Cities Services, Inc.
400 Area/419470	Wells 499-S1-8J, 499-S0-7, and 499-S0-8	Supplied from 499-S1-8J (P-16); 499-S0-8 (P-14) is the emergency supply, 499-S0-7 (P-15) is the dire emergency supply. Chlorination only. Operated by B&W Hanford Company.
300 Area/418408	Columbia River via 312 Pump-house or City of Richland	Filtered and chlorinated at 315 Building. Operated by DynCorp Tri-Cities Services, Inc.

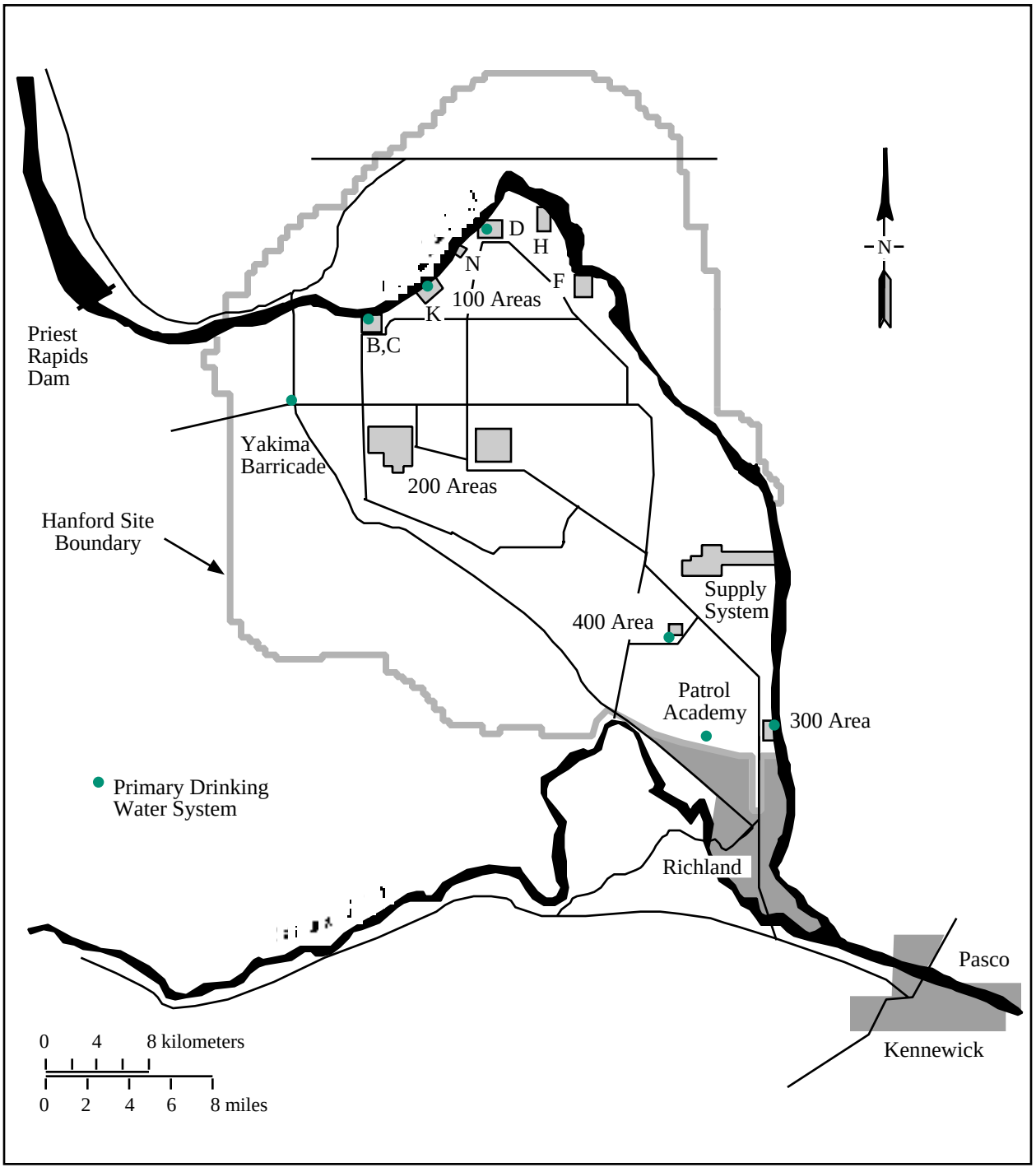

Figure 4.3.1. Hanford Site Primary Drinking Water Systems

decreased dramatically in 1992 (Figure 4.3.2) and are currently lower than levels in well 499-S0-7 (Table 4.3.2). Well 499-S0-8 was used once when the primary supply well (499-S1-8J) was shut down for repair between December 30, 1996 and January 6, 1997. All three wells remain operational to maintain fire suppression capabilities within the 400 Area.

Radiological monitoring of well water from the Fitzner/ Eberhardt Arid Lands Ecology Reserve was discontinued in 1996. Bottled drinking water has been used at this location in recent years because of elevated levels of naturally occurring fluoride in the well water.

Collection of Drinking Water Samples and Analytes of Interest

Samples for radiological analysis were collected according to a schedule established at the beginning of the calendar year (Bisping 1996). 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 annually for iodine-129 analysis and quarterly for other analyses. Samples from most locations were grab samples of treated water collected at the tap. The 300 Area samples were cumulative raw river-water samples that were collected at the water supply pumphouse before any water treatment. Tap-water samples collected from the 100-B Area in May and the 400 Area in May and October 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's environmental radiation program annual report for 1996.

All 1996 drinking water samples were analyzed for total alpha, total beta, tritium or low-level tritium, and strontium-90. Additionally, samples from the 300 Area were analyzed for uranium, and concentrations of plutonium and americium were monitored in water from the 100-K Area. The 100-K Area samples were also analyzed by gamma spectrometry. One sample from the 400 Area was analyzed for iodine-129. Alpha and beta measurements provided a general indication of radioactive contamination. Gamma spectrometry was used to detect numerous specific radionuclides (see Appendix E). Sensitive radiochemical analyses were used to determine the concentrations of specific analytes.

Radiological Results for Hanford Site Drinking Water

The Hanford Site was in compliance with Washington State and EPA annual average radiological drinking water standards in 1996, and results were similar to those observed in recent years (Thurman 1995, Dirkes and Hanf 1996). Results for radiological monitoring of Hanford Site drinking water during 1996 are summarized in Table 4.3.3. Concentrations of total alpha, total beta, tritium, strontium-90, and uranium 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 Washington State and 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/yr. 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 concentration for each of total beta, total alpha, tritium, and strontium-90 are less than 50, 15, 20,000, and 8 pCi/L, respectively (see Appendix C, Table C.2).

Iodine-129 was measured in one sample of 400 Area drinking water collected in July. The result (0.01095 ± 0.00092 pCi/L) was well below the 1.0-pCi/L drinking water standards that would result in an annual dose equivalent of 4 millirem. Concentrations of plutonium, americium, uranium, and radionuclides measured by gamma spectrometry (Bisping 1997) were all below drinking water standards.

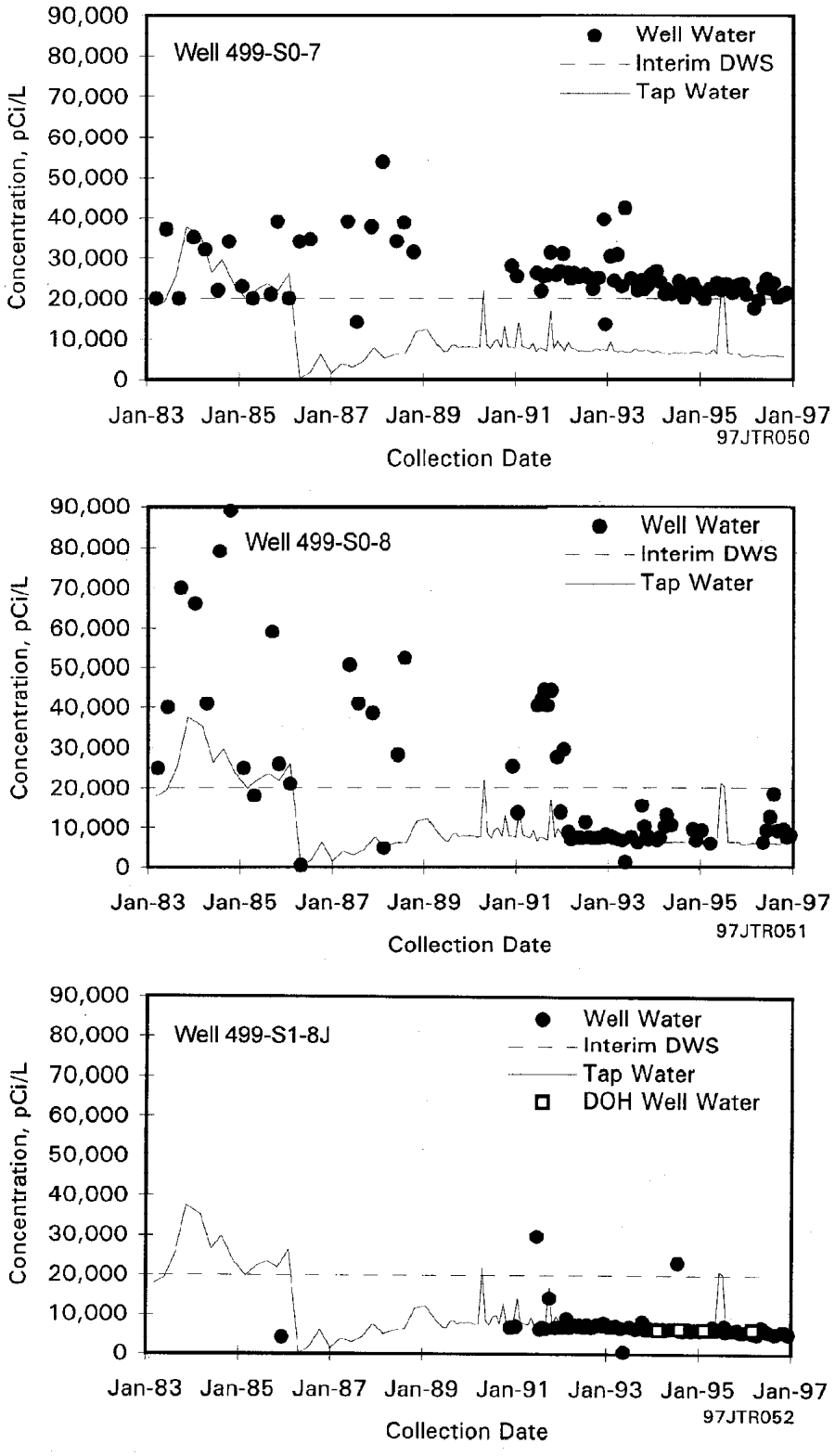

Figure 4.3.2. Comparison of Tritium Trends in 400 Area Drinking Water System (DOH = Washington State Department of Health, DWS = Drinking Water Standard

Table 4.3.2. Tritium Concentrations in 400 Area Drinking Water Wells, 1996

Well Number	Sampling Date, 1996	Concentration, pCi/L
499-S1-8J (P-16)	January 4	5,543.3
	March 5	5,231.0
	April 10	4,962.5
	May 14	6,824.7
	June 12	6,003.4
	July 8	5,557.3
	August 26	5,067.9
	September 6	5,130.2
499-S0-7 (P-15)	January 14	20,997
	March 5	17,561
	April 10	19,535
	May 14	22,616
	June 12	24,844
	July 8	22,485
	August 5	23,858
	September 6	20,316
499-S0-8 (P-14)	May 14	6,060.4
	June 12	9,177.5
	July 8	12,502
	August 5	18,447
	September 6	9,100.9

Table 4.3.3. Radiological Contaminants in Hanford Drinking Water Systems, 1996 Annual Average Concentrations[a]

System	No. of Samples	Total Alpha, pCi/L	Total Beta, pCi/L	Tritium, pCi/L	Strontium-90, pCi/L	U-Total, pCi/L
100-B Area	4	0.12 ± 0.21	1.23 ± 1.11	86.13 ± 35.52[b]	0.10 ± 0.02	NM[c]
100-D Area	4	0.20 ± 0.15	0.97 ± 0.90	82.07 ± 53.77	0.08 ± 0.03	NM
100-K Area[d]	4	0.16 ± 0.13[e]	0.59 ± 0.96	57.20 ± 21.24[e]	0.002 ± 0.1	NM
300 Area	4	0.68 ± 0.48	1.99 ± 1.36	133.78 ± 76.58[b]	0.13 ± 0.08	0.77 ± 0.31
Yakima Barricade	4	1.80 ± 1.23	5.78 ± 1.12	-4.22 ± 34.09	0.02 ± 0.03	NM
400 Area	4	-0.005 ± 0.19	5.68 ± 1.82	5,692 ± 188	0.20 ± 0.38	NM
Patrol Academy	4	0.80 ± 0.44	3.76 ± 0.58	-0.75 ± 64.00	0.001 ± 0.009	NM
Standards[f]		15	50	20,000	8	

(a) Average value ±2 standard error of the calculated mean.
(b) Low-level tritium.
(c) NM = Not measured.
(d) Reported by DE&S Hanford, Inc.
(e) Computed using a questionable result obtained for first quarter sample.
(f) See Appendix C (Table C.2).