9.0 Quality Assurance

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Quality assurance and quality control practices encompassed all aspects of Hanford Site environmental monitoring and surveillance programs. This section discusses specific measures taken to ensure quality in project management, sample collection, and analytical results.

Samples were collected and analyzed according to documented standard analytical 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.

Quality assurance/quality control for the Hanford Site environmental monitoring and surveillance programs also include procedures and protocols to

- document instrument calibrations
- conduct program-specific activities in the field
- maintain groundwater wells to ensure representative samples were collected
- avoid cross-contamination by using dedicated well sampling pumps.

9.1 Environmental Surveillance and Groundwater Monitoring

During 2000, comprehensive quality assurance programs, including various quality control practices, were maintained to ensure the quality of data collected through the Surface Environmental Surveillance Project and the Hanford Groundwater Monitoring Project. Quality assurance plans were maintained for all program activities and defined the appropriate controls and documentation required by the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE) for the project-specific requirements.

9.1.1 Project Management Quality Assurance

Site environmental surveillance, groundwater monitoring, and related programs such as processing of thermoluminescent dosimeters and performing dose calculations were subject to an overall quality assurance program. This program implemented the requirements of DOE Order 414.1A.

The site surveillance and groundwater monitoring projects maintained quality assurance plans that described the specific quality assurance elements that applied to each project. These plans were approved by a quality assurance organization that conducted surveillances and audits to verify compliance with the plans. Work performed through contracts, such as sample analysis, must meet the same quality assurance requirements. Potential equipment and service suppliers were audited before service contracts or material purchases that could have had a significant impact on quality within the project were approved and awarded.

9.1.2 Sample Collection Quality Assurance/Quality Control

Surface Environmental Surveillance Project samples were collected by staff trained to conduct sampling according to approved and documented procedures (PNL-MA-580). Continuity of all sampling location identities was maintained through careful documentation. Field replicates were collected for specific media and a summary of the 2000 results is provided in Table 9.1. Eighty-eight percent of the field replicate results for 2000 were acceptable. The results were within the control limits of ±30% for the sample and duplicate results.

Samples for the Hanford Groundwater Monitoring Project were collected by trained staff according to approved and documented procedures (PNNL-13404, Appendix B). Chain-of-custody procedures were followed (SW-846) that provided for the use of evidence tape in sealing sample bottles to maintain the integrity of the samples during shipping. Full trip blanks and field replicates were obtained during field operations. Summaries of the 2000 groundwater field quality control sample results are provided in Appendix B of PNNL-13404 or at the web address http://hanford-site.pnl.gov/groundwater/reports/gwrep00/html/start1.htm. The percentage of acceptable field blank and replicate results in fiscal year 2000 were very high – 96% for field blanks and 99% for field replicates.

9.1.3 Analytical Results Quality Assurance/Quality Control

Routine chemical analyses of water samples were performed under contract primarily by Severn Trent Laboratories, Incorporated, St. Louis, Missouri, for environmental surveillance and groundwater monitoring. Some routine analyses of hazardous and nonhazardous chemicals for the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) groundwater program were also performed under contract by Recra Environmental, Inc., Lionsville, Pennsylvania. Each laboratory participated in the EPA Water Pollution and Water Supply Performance Evaluation Studies. Each

Table 9.1. Summary of Surface Environmental Surveillance Project Field Replicate Results, 2000

Medium	Radionuclides	Number of Results Reported	Number Within Control Limits[a]
Air filters	Gross alpha	27	16
	Gross beta	27	24
	^{3}H	12	6
	^{7}Be, ^{40}K, ^{60}Co, ^{106}Ru, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{154}Eu, ^{155}Eu	36	36
Water	Gross alpha	1	1
	Gross beta	1	1
	^{3}H	4	4
	^{7}Be, ^{40}K, ^{60}Co, ^{106}Ru, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{154}Eu, ^{155}Eu	9	9
	^{90}Sr	3	2
	^{234}U, ^{235}U, ^{238}U	9	9
Milk	^{7}Be, ^{40}K, ^{60}Co, ^{106}Ru, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{154}Eu, ^{155}Eu	36	36
	^{90}Sr	4	4
	^{3}H	1	1

(a) The sample and duplicate results are acceptable if they fall within the control limit of ±30% for the sample and duplicate results above the detection limit or minimum detectable concentration.

laboratory maintained an internal quality control program that meets the requirements in SW-846, which is audited and reviewed internally and by Pacific Northwest National Laboratory. Pacific Northwest National Laboratory submitted additional quality control double-blind spiked samples for analysis.

Routine radiochemical analyses of samples for the Surface Environmental Surveillance and Hanford Groundwater Monitoring Projects were performed primarily by Severn Trent Laboratories, Incorporated, Richland, Washington. Data from Thermo-Retec, Richmond, California, were also used in the fiscal year 2000 groundwater evaluations. Each laboratory participated in DOE's Quality Assessment Program at the Environmental Measurements Laboratory in New York, and the Proficiency Testing Program at Environmental Resource Associates in Arvada, Colorado. The Environmental Resource Associates program replaced the EPA's Laboratory Intercomparison Studies Program, which terminated in December 1998. Environmental Resource Associates prepared and distributed proficiency standard samples according to EPA requirements. An additional quality control blind spiked sample program was conducted for each project. Each laboratory also maintained an internal quality control program, which was audited and reviewed internally and by Pacific Northwest National Laboratory. Additional information on these quality control efforts is provided in the following sections.

9.1.4 DOE and EPA Comparison Studies

Standard water samples were distributed blind to participating laboratories as part of the EPA performance evaluation program. These samples contained specific organic and inorganic analytes that had concentrations unknown to the analyzing laboratories. After analysis, the results were submitted to Environmental Resource Associates, the EPA performance evaluation program sponsor, for comparison with known values and results from other participating laboratories. Summaries of the results for 2000 are provided in PNNL-13404, Appendix B, for the primary laboratory, Severn Trent Laboratories, Incorporated, St. Louis, Missouri.

The DOE Quality Assessment Program and Environmental Resource Associates' Proficiency Testing Program provided standard samples of environmental media (e.g., water, air filters, soil, vegetation) that contained specific amounts of one or more radionuclides that were unknown by the participating laboratory. After analysis, the results were forwarded to DOE or Environmental Resource Associates for comparison with known values and results from other laboratories. Both DOE and Environmental Resource Associates had established criteria for evaluating the accuracy of results (NERL-Ci-0045; EML-608; EML-611). Summaries of the 2000 results are provided in Tables 9.2 and 9.3. Eighty-one percent of the DOE quality assessment sample results fell within the acceptable control limits. Ninety-four percent of the Environmental Resource Associates samples fell within the acceptable control limit range.

9.1.5 Pacific Northwest National Laboratory Evaluations

In addition to DOE and EPA interlaboratory quality control programs, Pacific Northwest National Laboratory maintained a quality control program to evaluate analytical contractor precision and accuracy and to conduct special intercomparisons. This program included the use of blind spiked samples. Blind spiked quality control samples and blanks were prepared and submitted to check the accuracy and precision of analyses at Severn Trent Laboratories, Incorporated. In 2000, blind spiked samples were submitted for groundwater (PNNL-13404, Appendix B) and for air filters, vegetation, soil, and surface water (Table 9.4). For results of all water sample non-radiochemistry blind spiked determinations, see discussion of results in Appendix B of PNNL-13404.

Table 9.2. Summary of Laboratory Performance on DOE Quality Assessment Program Samples, 2000

Medium	Radionuclides	Number of Results Reported for Each Analyte	Number Within Acceptable Control Limits[a]
Severn Trent Laboratories, Richland, Washington			
Air filter particulate	^{54}Mn, ^{57}Co, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{238}Pu, ^{238}U, ^{239}Pu, ^{241}Am, total uranium	2	2
	Gross alpha, gross beta, ^{234}U	2	1
	^{106}Ru, ^{134}Cs	1	1
Soil	^{40}K, ^{90}Sr, ^{214}Bi, ^{214}Pb, ^{228}Ac, ^{234}U, ^{238}U, ^{239}Pu, ^{241}Am, total uranium	2	2
	^{137}Cs, ^{212}Pb	2	1
	^{238}Pu	1	1
	^{234}Th	1	0
Vegetation	^{40}K, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{239}Pu, ^{241}Am, ^{244}Cm	2	2
Water	Gross alpha, gross beta, ^{3}H, ^{90}Sr, ^{137}Cs, ^{234}U, ^{238}Pu, ^{238}U, ^{239}Pu, ^{241}Am, total uranium	2	2
	^{55}Fe, ^{60}Co, ^{63}Ni	1	1

(a) Control limits are from EML-608 and EML-611.

Table 9.3. Summary of Laboratory Performance on Environmental Resource Associates Proficiency Testing Program, 2000

Medium	Radionuclides	Number of Results Reported for Each Analyte	Number Within Control Limits for Each Analyte[a]
Severn Trent Laboratories, Richland, Washington			
Water	Gross alpha	7	7
	Gross beta	7	6
	^{60}Co, ^{137}Cs, ^{226}Ra, ^{228}Ra total uranium	6	6
	^{134}Cs	6	5
	^{89}Sr, ^{90}Sr	5	5
	^{65}Zn, ^{131}I, ^{133}Ba	3	3
	^{3}H	1	1

(a) Control limits are from NERL-Ci-0045.

Table 9.4. Summary of Surface Environmental Surveillance Project Blind Spiked Determinations, 2000

Medium	Radionuclides	Number of Results Reported	Number Within Control Limits[a]
Air filters	Gross alpha, gross beta, ^{60}Co, ^{90}Sr, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{238}Pu, ^{239}Pu	11	11
Soil	^{40}K, ^{90}Sr, ^{137}Cs, ^{238}Pu, ^{239}Pu	10	10
Water	^{3}H, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{238}Pu, ^{239}Pu	12	12
Vegetation	^{40}K, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{239}Pu	9	9

(a) Control limit of ±30%.

For all media, 100% of Severn Trent Laboratories, Incorporated, Richland, radiochemistry blind spiked determinations were within control limits, which indicated acceptable results.

9.1.6 Quality Assurance Task Force Results

Pacific Northwest National Laboratory also participated in a Quality Assurance Task Force, a program coordinated by the Washington State Department of Health. Public and private organizations from Idaho, Oregon, Washington, and Georgia participated in analyzing the intercomparison samples in 1999 and 2000. For the 1999 intercomparison sample exchange, samples from a Hanford Site well were collected; in 2000, soil was collected on the site from the 100 and 300 Areas and composited for analysis. Summary results from both studies are presented in Tables 9.5 and 9.6.

9.1.7 Laboratory Internal Quality Assurance Programs

The analytical laboratories were required to maintain an internal quality assurance and control program. Periodically, the laboratories were audited internally for compliance to the quality assurance and control programs. At Severn Trent Laboratories, Incorporated, St. Louis, the quality control programs met the quality assurance and control criteria in SW-846. The laboratories were also required to maintain a system to review and analyze the results of the quality control samples to detect problems that may have arisen from contamination, inadequate calibrations, calculation errors, or improper procedure performance. Method detection levels were determined at least annually for each analytical method.

Table 9.5. Comparison[a] of the Quality Assurance Task Force Intercomparison Well Water Analytical Results, 1999

Radionuclide	Number of Results	Intercomparison Sample Concentrations, pCi/L
Gross Beta		
Grand Mean	26	3,153 ± 774
PNNL	3	3,607 ± 248
Strontium-90		
Grand Mean	20	1,634 ± 306
PNNL	3	1,857 ± 24
Tritium		
Grand Mean	23	24,503 ± 3,456
PNNL	3	23,200 ± 980

(a) Pacific Northwest National Laboratory (PNNL) analyses by Severn Trent Laboratories, Incorporated, Richland, Washington, are compared against grand mean (±2 standard deviation) of participating laboratories.

Table 9.6. Comparison[a] of the Quality Assurance Task Force Intercomparison Soil Analytical Results, 2000

Radionuclide	Number of Results	Intercomparison Sample Concentrations, pCi/L
Cobalt-60		
Grand Mean	25	1.85 ± 0.60
PNNL	3	1.57 ± 0.04
Cesium-134		
Grand Mean	14	0.046 ± 0.208
PNNL	3	0.008 ± 0.028
Cesium-137		
Grand Mean	25	43.8 ± 9.2
PNNL	3	39.2 ± 1.0
Europium-154		
Grand Mean	23	6.7 ± 7.5
PNNL	3	4.83 ± 0.24
Europium-155		
Grand Mean	22	1.0 ± 2.6
PNNL	3	0.83 ± 0.56
Potassium-40		
Grand Mean	21	12.6 ± 4.1
PNNL	3	9.8 ± 2.0
Strontium-90		
Grand Mean	9	1.22 ± 0.42
PNNL	3	1.15 ± 0.08
Uranium-234		
Grand Mean	14	312 ± 146
PNNL	3	309 ± 64
Uranium-235		
Grand Mean	22	15.2 ± 6.6
PNNL	3	12.3 ± 3.4
Uranium-238		
Grand Mean	14	311 ± 142
PNNL	3	310 ± 60

(a) Pacific Northwest National Laboratory (PNNL) analyses by Severn Trent Laboratories, Incorporated, Richland, Washington, are compared against grand mean (±2 deviation) of participating laboratories.

The internal quality control program at Severn Trent Laboratories, Incorporated, Richland involved routine calibrations of counting instruments, yield determinations of radiochemical procedures, frequent radiation check sources and background counts, replicate and spiked sample analyses, matrix and reagent blanks, and maintenance of control charts to indicate analytical deficiencies. Available calibration standards traceable to the National Institute of Standards and Technology were used for radiochemical calibrations. Calculation of minimum detectable concentrations involved the use of factors such as the average counting efficiencies and background for detection instruments, length of time for background and sample counts, sample volumes, radiochemical yields, and a pre-designated uncertainty multiplier (EPA 520/1-80-012).

Periodically, inspections of services were performed that documented conformance with contractual requirements of the analytical facility and provided the framework to identify and resolve potential performance problems. Responses to assessment and inspection findings were documented by written communication, and corrective actions were verified by follow-up audits and inspections. In 2000, the Hanford Site's Integrated Contractor Assessment Team, consisting of representatives from Bechtel Hanford, Inc., Pacific Northwest National Laboratory, and Waste Management Federal Services of Hanford, Inc., conducted assessments of Severn Trent Laboratories, Incorporated, St. Louis and Severn Trent Laboratories, Incorporated, Richland. The purpose of the assessment was to evaluate the continued capability of the laboratories to analyze and process samples for the Hanford Site as specified in the statement of work between the DOE contractors and the laboratories.

Internal laboratory quality control program data were reported with the analytical results. Scientists at Pacific Northwest National Laboratory summarized the results quarterly. The results of the quality control sample summary reports indicated an acceptable performance for the internal quality control program.

9.1.8 Media Audits and Comparisons

Additional audits and comparisons were conducted on several specific types of samples. The Washington State Department of Health routinely cosampled various environmental media and measured external radiation levels at multiple locations during 2000. Media that were cosampled and analyzed for radionuclides included groundwater, water from 10 locations along and across the Columbia River, water from six riverbank springs, water from one onsite drinking water location, sediment from nine Columbia River sites, samples from four air monitoring stations, thermoluminescent dosimeters from 12 sites, hops, carp, and mule deer. Also cosampled and analyzed for radionuclides were upwind and downwind samples of leafy vegetables, fruit, potatoes, and wine. The Washington State Department of Health and Pacific Northwest National Laboratory cosampled data may be found in PNNL-13487, APP. 1. The air particulate gross beta data for three sampling locations are compared graphically in Figures 9.1, 9.2, and 9.3. For these three locations, gross beta data from the two organizations compare favorably.

The U.S. Food and Drug Administration also cosampled from upwind and downwind sampling locations and analyzed apples, leafy vegetables (cabbage and beet leaves), and potatoes for radionuclides. The data are presented in Table 9.7. There is good agreement between the U.S. Food and Drug Administration and Pacific Northwest National Laboratory data.

Quality control for environmental thermoluminescent dosimeters included the audit exposure of three environmental thermoluminescent dosimeters per quarter to known values of radiation (between 17 and 28 mR). A summary of 2000 results is shown in

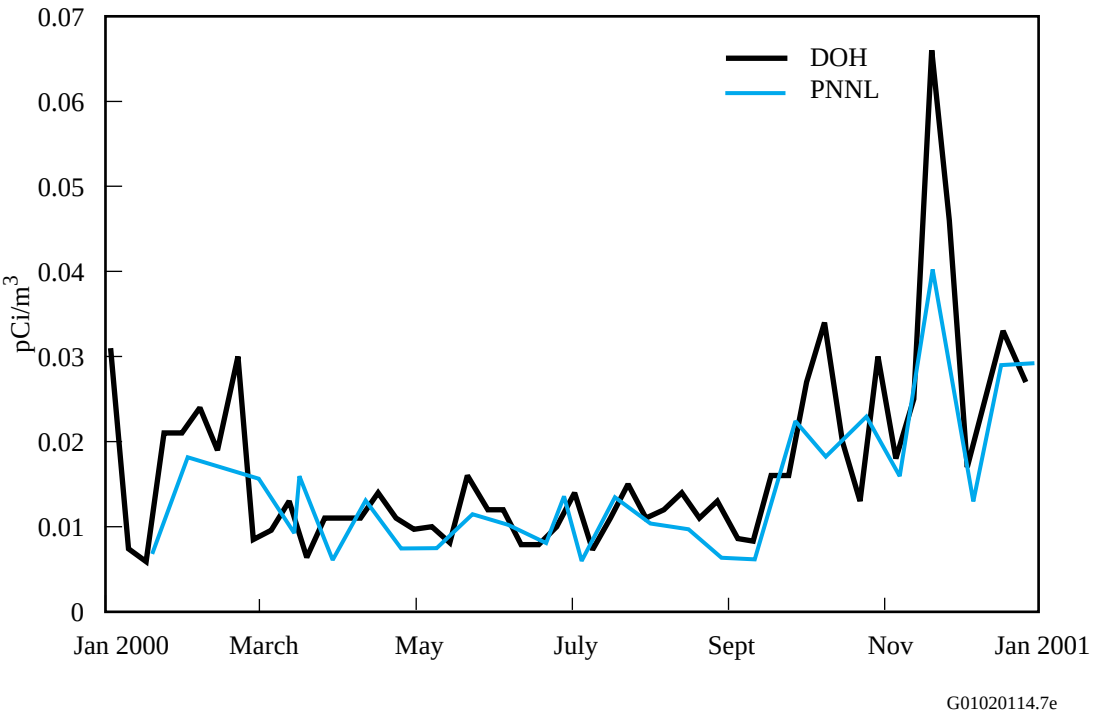

Figure 9.1. Gross Beta Concentrations (pCi/m³) in Air Particulate Samples Cosampled by the Pacific Northwest National Laboratory and the Washington State Department of Health at the West End of Fir Road (see Figure 4.1.1 for location of sampling station)

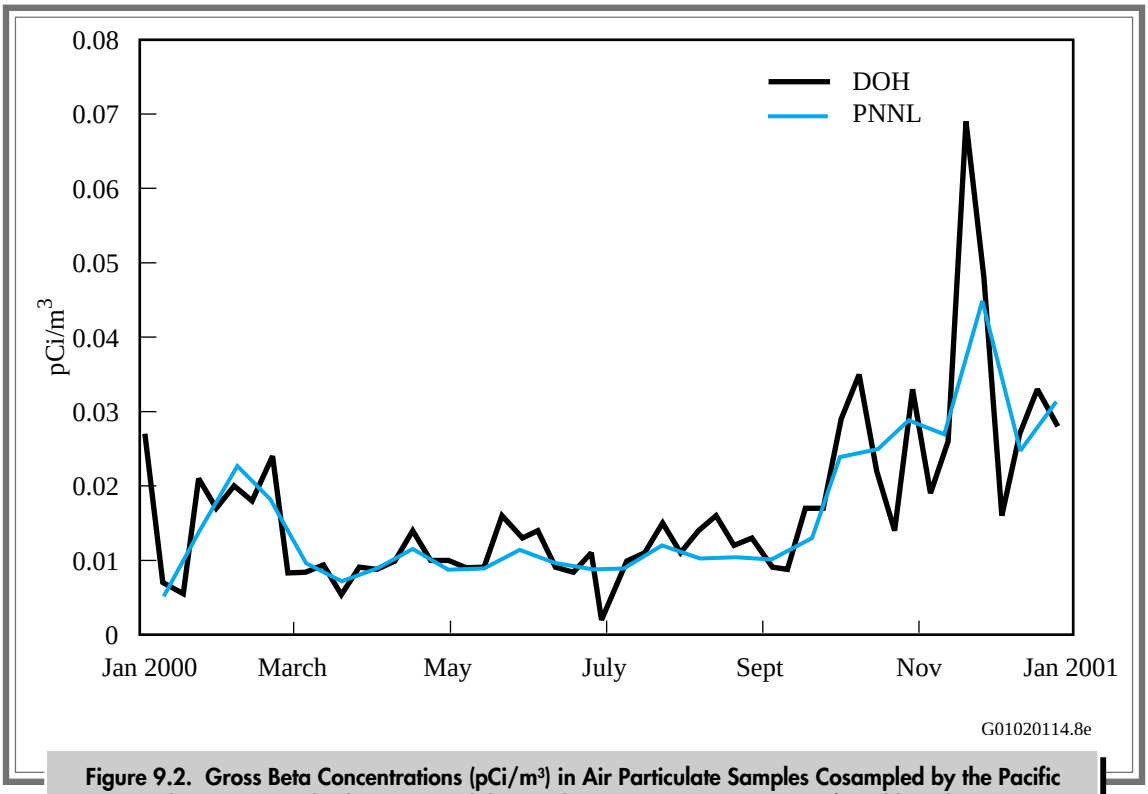

Figure 9.2. Gross Beta Concentrations (pCi/m³) in Air Particulate Samples Cosampled by the Pacific Northwest National Laboratory and the Washington State Department of Health at the Wye Barricade (see Figure 4.1.1 for location of sampling station)

Table 9.8. On average, the thermoluminescent dosimeter measurements were unbiased. For 12 measurements, the lowest measurement of measured/known was 95% and the highest measured/known was 110%, with an average of 100 ± 4.

9.2 Effluent Monitoring and Near-Facility Environmental Monitoring

The Effluent Monitoring and Near-Facility Environmental Monitoring Programs were subject to the quality assurance requirements specified in the Hanford Analytical Services Quality Assurance Requirements Document (DOE/RL-96-68). These quality assurance programs complied with DOE Order 414.1A, using standards from the American Society of Mechanical Engineers (ASME NQA-1-1997 Edition) as their basis. The programs also adhered to the guidelines and objectives in EPA/005/80 and EPA QA/R-5.

The monitoring programs each had a quality assurance project plan describing applicable quality assurance elements. These plans were approved by contractor quality assurance groups, who conducted surveillances and audits to verify compliance with the plans. Work such as sample analysis performed through contracts had to meet the requirements of these plans. Suppliers were audited before the contract selection was made for equipment and services that may have significantly affected the quality of a project.

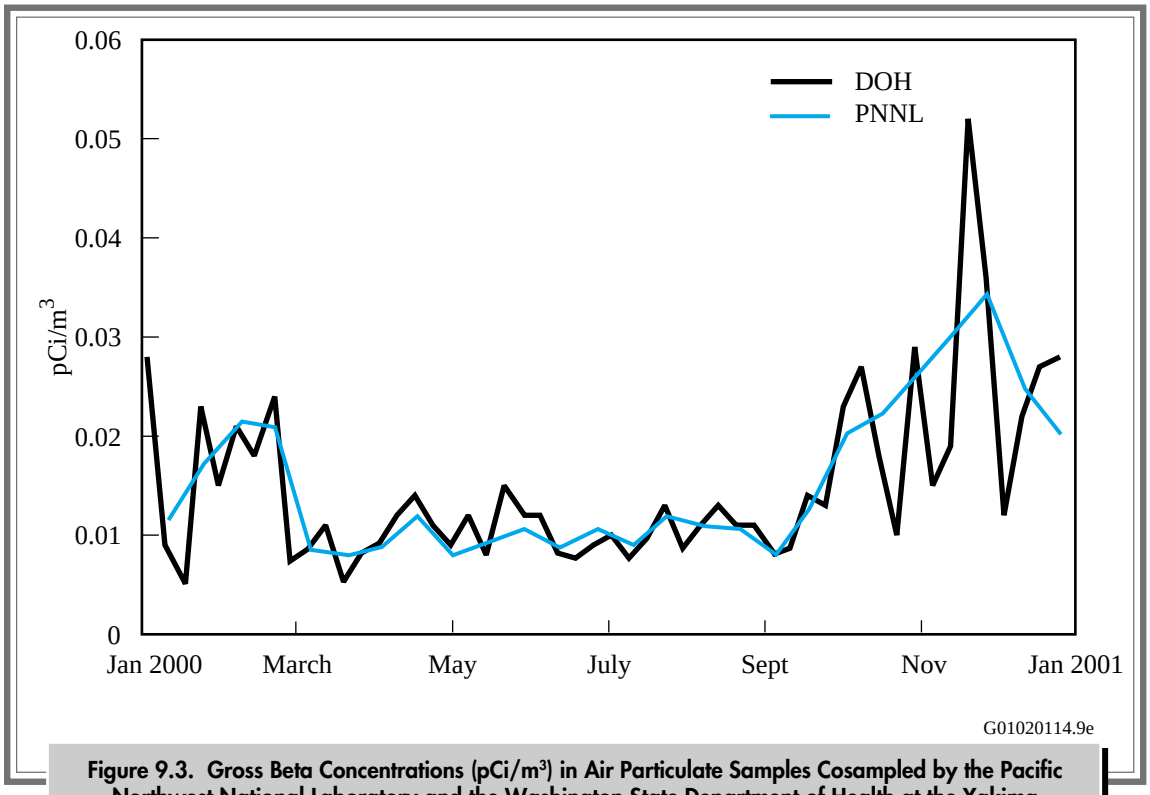

Figure 9.3. Gross Beta Concentrations (pCi/m³) in Air Particulate Samples Cosampled by the Pacific Northwest National Laboratory and the Washington State Department of Health at the Yakima Barricade (see Figure 4.1.1 for location of sampling station)

9.2.1 Sample Collection Quality Assurance

Samples for the Effluent Monitoring and Near-Facility Environmental Monitoring Programs were collected by staff trained for the task in accordance with approved procedures. Established sampling locations were accurately identified and documented to ensure continuity of data for those sites and are described in DOE/RL-91-50.

9.2.2 Analytical Results Quality Assurance

Samples for the Effluent Monitoring and Near-Facility Environmental Monitoring Programs were analyzed by up to three different analytical laboratories. The use of these laboratories was dependent on the Hanford contractor collecting the samples and contract(s) established between the contractor and the analytical laboratory(s). Table 9.9 provides a summary of the Hanford Site's analytical laboratories used for effluent monitoring and near-facility monitoring samples.

The quality of the analytical data was ensured by several means. Counting room instruments, for instance, were kept within calibration limits through daily checks, the results of which were stored in computer databases. Radiochemical standards used in analyses were regularly measured and the results were reported and tracked. Formal, written laboratory procedures were used to analyze samples. Analytical procedural control was ensured through administrative procedures. Chemical technologists at the laboratory qualified to perform analyses through formal classroom and on-the-job training.

Table 9.7. Comparison of U.S. Food and Drug Administration Cosampling, 2000

Medium	Sampling Area[a]	Organization[b]	Strontium-90, pCi/g[c]	Cesium-137, pCi/g[c]	Ruthenium-106, pCi/g[c]
Leafy vegetables	Riverview	FDA[d]	<0.002	<0.045	<0.10
		FDA	<0.002	<0.045	<0.10
		PNNL[e]	<0.0020	<0.0089	<0.078
	Sunnyside	FDA	0.0041 ± 0.0007[f]	<0.045	<0.10
		FDA	0.0097 ± 0.0007[f]	<0.045	<0.10
		PNNL	0.012 ± 0.0044[f]	<0.012	<0.10
Potatoes	Sunnyside	FDA	<0.002	<0.045	<0.10
		FDA	<0.002	<0.045	<0.10
		PNNL	<0.030	<0.0060	<0.050
	Sagemoor	FDA	<0.002	<0.045	<0.10
		FDA	<0.002	<0.045	<0.10
		PNNL	<0.0023	<0.0058	<0.052
Apples	Sagemoor	FDA	<0.002	<0.045	<0.10
		FDA	<0.002	<0.045	<0.10
		PNNL	<0.0017	<0.0094	<0.076
	Riverview	FDA	<0.002	<0.045	<0.10
		FDA	<0.002	<0.045	<0.10
		PNNL	<0.0020	<0.0091	<0.080

(a) Locations are identified in Figure 4.4.1.
(b) Two samples of each medium were collected for FDA, one for PNNL.
(c) Less than (<) values are the 2 sigma total propagated analytical uncertainties.
(d) FDA = U.S. Food and Drug Administration.
(e) PNNL = Pacific Northwest National Laboratory.
(f) ±2 sigma total propagated analytical uncertainty.

Table 9.8. Comparison of Thermoluminescent Dosimeter Results with Known Exposure, 2000

Quarter	Exposure Date	Known Exposure, mR[a]	Determined Exposure, mR[b]	% of Known Exposure
1st	February 23, 2000	17 ± 0.63	17.23 ± 0.81	101
	February 23, 2000	25 ± 0.93	25.07 ± 1.20	100
	February 23, 2000	28 ± 1.04	27.71 ± 0.98	99
2nd	May 19, 2000	18 ± 0.67	17.43 ± 0.01	97
	May 19, 2000	21 ± 0.78	20.29 ± 0.14	97
	May 19, 2000	27 ± 1.00	26.70 ± 0.52	99
3rd	August 15, 2000	19 ± 0.70	20.96 ± 1.29	110
	August 15, 2000	24 ± 0.89	24.33 ± 0.70	101
	August 15, 2000	26 ± 0.96	25.61 ± 0.43	99
4th	November 20, 2000	18 ± 0.67	17.01 ± 0.00	95
	November 20, 2000	22 ± 0.81	23.02 ± 0.55	105
	November 20, 2000	25 ± 0.93	24.73 ± 0.62	99

(a) ±2 sigma total propagated analytical uncertainty.
(b) ±2 times the standard deviation.

Table 9.9. Hanford Site Laboratories used by Contractor and Sample Type, 2000

Analytical Laboratory	Effluent Monitoring Samples					Near-Facility Environmental Monitoring Samples		
	Fluor Hanford, Inc.		Pacific Northwest National Laboratory	Bechtel Hanford, Inc.		Fluor Hanford, Inc.		
	Air	Water	Air	Air	Water	Air	Water	Other
Waste Sampling and Characterization Facility[a]	X	X		X	X	X	X	X
222-S Analytical Laboratory[a]								X
Severn Trent Laboratories, Inc., Richland	X	X	X	X	X			
Analytical Chemistry Laboratory[b]	X	X	X					

(a) Operated by Fluor Hanford, Inc.
(b) Operated by Pacific Northwest National Laboratory.

The participation of the Hanford Site analytical laboratories in EPA and DOE laboratory performance programs also served to ensure the quality of the data produced. Laboratory performance program results for calendar year 2000 for the Waste Sampling and Characterization Facility were evaluated in two different studies. In the EPA Water Pollution Study # 66 and a Quick Response Study, 196 different parameters, analytes, and compounds were submitted to the Waste Sampling

Table 9.10. Waste Sampling and Characterization Facility[a] Performance on DOE Quality Assessment Program Samples, 2000

Medium	Radionuclide	Number of Results Reported	Number Within Control Limits
Air filters	^{54}Mn, ^{57}Co, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{234}U, ^{238}Pu, ^{238}U, ^{239}Pu, ^{241}Am, gross alpha, gross beta	24	23 (^{90}Sr failed once)
Soil	^{40}K, ^{90}Sr, ^{137}Cs, ^{234}U, ^{238}U, ^{239}Pu, ^{241}Am	14	13 (^{90}Sr failed once)
Vegetation	^{40}K, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{239}Pu, ^{241}Am, ^{244}Cm	13	12 (^{60}Co failed once)
Water	^{3}H, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{234}U, ^{238}Pu, ^{238}U, ^{239}Pu, ^{241}Am, gross alpha, gross beta	22	22

(a) Onsite laboratory operated by Fluor Hanford, Inc.

Table 9.11. 222-S Analytical Laboratory[a] Performance on DOE Quality Assessment Program Samples, 2000

Medium	Radionuclide	Number of Results Reported	Number Within Control Limits
Air filters	^{54}Mn, ^{57}Co, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{238}Pu, ^{239}Pu, ^{241}Am	16	16
Soil	^{90}Sr, ^{137}Cs, ^{212}Pb, ^{214}Bi, ^{214}Pb, ^{228}Ac, ^{239}Pu, total uranium	14	12
Vegetation	^{60}Co, ^{90}Sr, ^{137}Cs, ^{239}Pu, ^{241}Am, ^{244}Cm	12	11
Water	^{3}H, ^{60}Co, ^{63}Ni, ^{90}Sr, ^{137}Cs, ^{238}Pu, ^{239}Pu, ^{241}Am, gross alpha, gross beta, total uranium	21	20

(a) Onsite "high-level" radiological laboratory operated by Fluor Hanford, Inc. (Note: These samples are "low-level" environmental activity samples.)

Table 9.12. 222-S Analytical Laboratory[a] Performance on Environmental Resource Associates Laboratory Water Pollution Inorganic Studies, 2000

Laboratory	Water Pollution Study April 2000 % Acceptable	Water Pollution Study October 2000 % Acceptable
222-S Analytical Laboratory	97[b]	95[c]

(a) Onsite "high-level" radiological laboratory operated by Fluor Hanford, Inc.
(b) Thirty-seven of 38 analytes scored as acceptable. Acceptable with warning result for conductivity scored as unacceptable.
(c) Thirty-eight of 40 analytes scored as acceptable. Unacceptable result for conductivity and acceptable with warning result for total suspended solids both scored as unacceptable.

Characterization Facility for analysis. Fourteen analytes were unacceptable for a total of 93% acceptable analysis results. In the DOE Mixed Analyte Performance Evaluation Program studies (MAPEP-00-W7 and MAPEP-00-S7), 66 analytes and/or compounds were submitted to the Waste Sampling Characterization Facility for analysis. Six analytes were unacceptable for a total of 91% acceptable analysis results. Other performance results are presented in Tables 9.10 through 9.12.

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